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SPACE; COOPERATION; LAW

V. S. Vereshchetin

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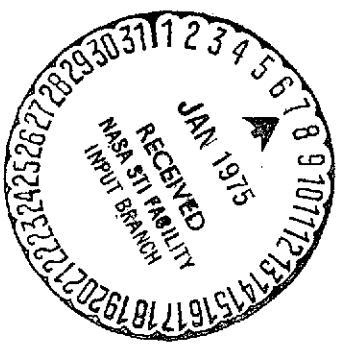

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16. Abstract The book gives a brief history of international cooperation in space by the Soviet Union, discusses the role of law in development of cooperation, presents various aspects of the Interkosmos program and discusses bilateral cooperation programs with the U.S.A., France and India. Joint programs between the U.S.A. and western European countries and the organization and programs of ESRO and related organizations in western Europe are discussed. International programs of NASA, organization and activities of the UN Committee on Peaceful Uses of Space, COSPAR and the International Federation of Astronautics are discussed. Information is presented on organization and activities of international communication satellite organizations, meteorological satellites and organizations, earth resources satellites, organizations and international agreements and on the Soyuz-Apollo program. Texts of international agreements on space programs are presented, including those with France, Israel, India, U.S.A. and Sweden, as well as a position paper on the peaceful uses of space by the socialist countries and the document creating Intersputnik.

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Two books were recently published under the auspices of the USSR Academy of Sciences on cooperation in space exploration and space law. The one by V. S. Vereshchetin is edited and introduced by academician B. N. Petrov, chairman of the "Intercosmos" Council of the Academy; its main orientation is political. The main Soviet international space programs are reviewed, some scientific and pragmatic achievements in space are noted, and the regulatory role of international space law is stressed. Historical and traditional bases for space cooperation are found, and cooperation in space is related to cooperation between governments in other areas. The leading role of the Soviet Union in cooperation and achievement is emphasized, although the book includes a section dealing with international programs conducted by NASA.

ANNOTATION

A detailed picture is given in the book of the state of cooperation in space research, and international space programs of the Soviet Union, United States of America and other countries are related. The legal mechanism regulating cooperation is revealed, and the interrelations of scientific-technical and juridicial problems in mastery of space are pointed out.

The book is intended for a broad group of readers.

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A WORD TO THE READER

The book Space; Cooperation; Law is devoted to questions of /3* lively interest to many readers. A broad spectrum of scientific-technical, political and legal problems of international cooperation in the investigation and use of space are touched on in it.

The cooperation of scientists of various countries in study of the earth and the universe has its roots in the distant past, and it rests on historical traditions. The appearance of rocket and space technology resources disclosed fundamentally new possibilities and direct study in mastery of the space surrounding us. The scientific and applied problems solved by means of these resources, and their breadth and diversity made cooperation urgently necessary, not only between individual scientists and groups, but on the intergovernment level.

Having penetrated into space, man perceived his connection with the universe more acutely than ever before. With each year, one manifestation of space activity or another entered the lives of more and more new countries and peoples. Space communication systems and weather satellites serve many governments and continents. The global scales of experiments carried out and their complex nature requires the broadest international participation.

The Soviet Union has brought into being fruitful cooperation with many governments, desiring to make their contributions to the overall matter of study and mastery of space. The relations of daily, mutually advantageous cooperation is strongly binding us to the governments of socialist cooperation. A large program of joint work in space has been accomplished over a period of years with France. Cooperation with India and other countries is actively /4 being developed. An important event in international life was the signing in 1972, during the high-level Soviet-American meeting, of the Agreement on Cooperation in Study and Use of Space for Peaceful Purposes, between the USSR and U.S.A.

In the book, V. S. Vereshchetin objectively reports the principal international cooperative programs of the Soviet Union. The author also gives the general picture of international cooperation in the scientific and applied fields of mastery of space and discloses the tight connection between scientific-technical and juridicial aspects of cooperation, emphasizing the regulating role of international space law.

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*Numbers in the margin indicate pagination in the foreign text.

Joint work of the governments in space is one of the most important and promising fields of international scientific and technical communications. Cooperation in study and use of space brings the governments together and assists in general improvement in the international situation.

Despite the large scales and diverse forms of international cooperation of the Soviet Union in space research, problems of international cooperation in space, including their political and juridicial aspects, still have been brought to light inadequately in our literature. Therefore, the appearance of the book of V. S. Vereshchetin, which fills this gap, should be welcomed.

Academician B. N. Petrov,
Chairman, Intercosmos Council,
Academy of Sciences, USSR.

CHAPTER 1

SPACE IS OPEN TO ALL

1. International Cooperation in Space. A Short History.

People of science, occupied with study of the universe, felt /5
the need for contact between themselves earlier and more acutely than others. The reasons for this are concealed in the immensity of the object of study itself and in the practical interest of all mankind in the results of their work.

Astronomy, arising several thousand years ago, in connection with practical needs of mankind, gives us the earliest examples of international cooperation of scientists. As early as the first half of the 18th century, international astronomical expeditions were conducted and, beginning with the joint observations of the transits of Venus across the disk of the sun in 1761 and 1769, the practice of coordinated and simultaneous observations of the most interesting astronomical phenomena by scientists of different countries was established.

The International Union on Cooperation in Research on the Sun was established, among the first international societies of scientists, in 1904. The presently existing Internation Astronomical Union was formed in 1919. Dozens of national scientific institutions and more than a thousand astronomers of the entire world actively participate in its work.

Another field of knowledge, in which international bonds between scientists were formed long ago, is the earth sciences: geography, geology, geodesy and geophysics.

The necessity for extensive exchange of scientific data obtained in different countries, as a result of geographical discoveries, and their comparison created the need for conducting international geographical congresses, the counting of which began in 1871. Somewhat later, in 1878, geologists gathered in Paris, in their first international congress.

Everybody remembers the "International Geophysical Year" /6
(1957-1958), when scientific institutions of 66 countries joined to conduct a program of simultaneous study of our planet, on an unprecedented scale. Special expeditions were outfitted for the Arctic and Antarctic. About 70 scientific ships conducted oceanographic research. All the observatories of the world organized continual observation of the sun.

The International Geophysical Year went down in the history of world science, because it was precisely while it was going on, 4 October 1957, that the Soviet Union launched the first artificial earth satellite, revealing the greatest prospects to mankind.

The International Geophysical Year was the direct successor of two programs of joint geophysical observations in the Arctic, the first of which, the International Polar Year, was accomplished by the efforts of the scientists of 12 countries in 1882-1883. The second International Polar Year was conducted in 1932-1933.

The sciences of the earth and of the universe, having long-established traditions of international cooperation of scientists, received a new, powerful impulse for their development, with the appearance of rocket and space technology resources. Rockets, unmanned spacecraft and the flights of man in space opened the way to the knowledge of objects and phenomena, inaccessible to ground observation resources. Astronomers obtained the capability for the first time of carrying out observations and measurements directly in space and of celestial bodies, without the interference caused by the atmosphere of the earth. Geophysicists acquired new means for study of phenomena of interest to them, not locally, but on the scale of the entire earth and beyond its limits. Geologists and geophyicists use spacecraft to obtain images of extensive areas, combining various component parts of the natural environment.

Astronautics, this fusion of the newest achievements of many branches of science and technology, is a qualitatively new stage in study of the universe. It not only infinitely enriched methods of preception, but it provided the capability of changing from study of space to mastery of it, to propagation of the activities of man to the entire space of the solar system.

Space technology has had a tremendous effect on many scientific disciplines, and some of them are obligated to it for their very appearance. /7

But there is another side to the effect of space technology on world science; this is the further deepening and growth of international cooperation of scientists.

Study of the processes evolving on the scales of entire planets or of interplanetary space, having become accessible, owing to the resources of new technology, have required the agreed and coordinated action of many scientific groups in different countries of the world. Research on the sun-earth connections, various states of the atmosphere and ionosphere, and the magnetic and gravitational fields of earth and interplanetary space benefits considerably by a multiple approach, with use of both space and ground resources and the making of measurements at various points on the earth.

The rich experience of cooperation accumulated in the past has permitted astronomers and geophysicists to proceed earlier than

others to performance of multiple, many-sided research programs, using satellites. National and international stations, carrying out observations of the flights of artificial earth satellites are now scattered over the entire earth. With the organization of these observations, which are of great importance for solution of a number of scientific problems of astronomy, geodesy and geophysics, the first international contacts had begun in space research.

New tasks and prospects developing in basic science, with the appearance of rocket-space technology resources and the very logic of further development of science have urgently required the strengthening of international cooperation and unification of the efforts of scientists of different countries. This became still more obvious, when ways of practical use of space appeared.

In the word combination to which we have become accustomed, "research and application" of space, emphasis is now being placed more and more on the second word, "application." This is not depreciation of the role of basic research in space, which henceforth will occupy a major place in explanations of the true pictures and laws of the world around us, but the effort to more rapidly force space to serve mankind and assist in the solution of many terrestrial problems is fully justified.

Today, the use of space implies mainly to the use of spacecraf£8 for remote communications, meteorological forecasting, navigation and study of natural resources, on the scale of the entire earth.

The colossal size of such a country as ours, of course, permits engagement in these types of practical applications of astronautics within our territory. The first national space communication system, created in the Soviet Union, by means of the Molniya satellites and the Orbit' ground stations, which already has operated successfully for many years, is one of the proofs of this. However, the greatest effect in use of space can be achieved by the unified efforts and capabilities of many countries. Meteorological processes, knowledge of which is necessary for reliable weather forecasts and timely warnings of approaching natural calamities, are of a global nature. Commercial and fishing ships going out into the ocean require navigational protection through satellites. The natural environment, study of which has become possible, by means of space resources, does not know national boundaries. And all governments are interested in cheap and reliable communications over great distances.

Knowledge of the common benefits and interests in practical applications of space reseach has assisted in the situation that, precisely in this field, cooperation has acquired the closest nature and has led to the formation of a number of international programs and organizations.

Despite the growth in the number of so-called space powers, governments having their own launch resources and their own spacecraft, for the majority of the countries of the world, international cooperation will be the only way into space for a long time to come.

Only those states can have independent space programs, which have available at least four elements necessary for accomplishing them: carrier rockets, space ports, spacecraft and command-measurement complexes for tracking these craft and controlling them. The cost of each of the elements is so high, that only a few governments can allow themselves to have each of them separately and, all/9 the more, all of them together. It is not accidentally that even the leading space powers are thinking of finding ways to divide the financial burdens involved in mastery of space, and the highly developed industrial countries of western Europe have established intergovernment organizations and international consortiums of industrial companies, for joint development of carrier rockets and production of scientific and applied satellites.

It would seem that the high cost and complexity of space research is in favor of conduct of them having to remain the affair of a small number of scientifically and technically developed governments. However, the developing countries cannot remain as passive observers. They lawfully see an important means of eliminating their economic backwardness in the modern scientific and technical revolution. Space research and, especially, practical application of it, emerging in the role of catalyst of scientific and technical progress, can assist the developing countries in solving such urgent problems for them as elimination of illiteracy, study and mastery of natural resources, improvement of communication systems, increasing the quality of meteorological forecasts, etc.[1]

Questions of utilization of the achievements of space science and technology for the practical tasks facing the developing countries are being actively discussed in the United Nations Organization and its specially established organs. These questions were at the center of attention at the International Conference on Exploration and Use of Space for Peaceful Purposes, called by the UN in 1968 in Vienna, in which representatives of 78 countries and many international organizations participated.

India, actively seeking a way to rapidly overcome economic backwardness, given to it by the colonial past, is a shining example of a government, which recognized the role of modern technology, /10

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[1]See, for example, the book of the Iranian scientist, H. K. Afshar, The Innovative Consequences of Space Technology and the Problems of the Developing Countries, Teheran University Press, 1971. See also O. M. Belotserkovskiy, Kosmos i obrazovaniye [Space and Development], Znaniye Press, Moscow, 1972.

including space, in social-economic progress. In close cooperation with the USSR and other countries, she is creating her own space science and industry, and she is developing scientific and applied satellite systems. India established an international research rocket launching range. All this activity is being accomplished under the leadership of a special government organization.

Not only India, but countries, which are smaller in territory and population, are more and more actively participating in international space activities, establishing satellite tracking stations in their territory, connected to international space systems, and and training national staffs of researchers.

As we see, the necessity for development of scientific and technical cooperation in the mastery of space is dictated by a number of important objective reasons. It is completely obvious that consolidation of scientific, technical and material resources of the governments would permit more rapid solution of those giant-sized problems, which face people in mastering space, in this case, avoiding unnecessary duplication and useless expenditure of creative efforts and resources.

Of course, all this is pushing toward consolidation of the efforts of different countries, towards expansion of cooperation and working out common or coordinated programs.

But there are other objective realities in the world, which directly or indirectly affect the development of international scientific and technical cooperation in general and cooperation in mastery of space, in particular.

The process of joining the forces of different countries for purposeful activity in space is closely involved with development of social life on earth, by international political relationships and by the concrete goals, which the governments are pursuing in putting cooperation into practice. Of course, this process cannot be considered apart from the actual inequalities of economic and scientific potential of the various countries, nor can it be forgotten that space flights became possible, owing to the appearance of rocket technology resources, created in connection with the military requirements of governments.

The Soviet Union and the countries of socialist cooperation, /11 developing international cooperation in space, are guided by the interests of science, strengthening friendly relations between governments and attempting as rapidly as possible to make the practical achievements of astronautics available to all people.

Another approach to cooperation is sometimes displayed by the leading space powers of the western world. The striving of the U.S.A. to insure itself the maximum economic advantage in carrying out international programs (markets for the aerospace industry, improvement in the balance of trade, partial financing by other

countries of its space program and other things) is not hidden, even in official statements,[2] and it is revealed still more graphically in practical affairs. Examples of this are the relations of the U.S.A. with its west European partners on questions of the mastery of space and the persistent attempts of the U.S.A. to establish its dictates in creation of international space systems (Intelsat, Aerosat and others). At the same time, American propaganda, widely advertising the international programs of the U.S.A. in space, declares their supposedly open and disinterested nature and attempts to represent the U.S.A. to the outside world as a country, which willingly shares its scientific and technical achievements with other peoples.

Differences in approaches to the basic tasks of international cooperation in space, in its time, the openly proclaimed course of the U.S.A. toward extensive military use of space and the cold war situation explain why Soviet-American cooperation in exploration and use of space got underway in the past, with such difficulty and so slowly, although all nations are interested in its development.

Improvement in Soviet-American relations allowed areas of common interest to be found in scientific and practical aspects of the mastery of space, first and foremost, in the matter of guaranteeing greater safety of manned flights, which led to the signing by the Soviet Union and the United States, in 1972, of an intergovernment /12 agreement on cooperation in the exploration and use of space for peaceful purposes.

Despite all the difficulties and obstacles set in the way of truely equal cooperation in space research, it has stepped far ahead in the years past.

The forms and methods of international cooperation are highly diverse. They include bilateral and multilateral agreements, specially established international organizations, congresses and conferences of scientists and exchange of scientific and technical information and literature. Together with the development of space research, with expansion of its practical applications and the connection to this activity of greater and greater numbers of governments, the forms and the very nature of the cooperation are being improved.

In the first stage, the principal role has been played by joint discussion of the results of scientific research, comparison of procedures and some coordination of scientific projects. This type of cooperation has been carried out mainly through the channels of

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[2]See, for example, the statement of the head of the scientific-technical section, State Department, U.S.A., Herman Pollack, presented in the journal Astronautics and Aeronautics 10/9, 6 (1972).

international scientific organizations. At quite an early stage of space research, international cooperation was put together in conducting optical observations of artificial earth satellites. The scientific institutions of the socialist countries initially concluded a bilateral and, in 1962, a multilateral agreement for this purpose. A considerable number of bilateral agreements on locating satellite observation stations in foreign territories has been signed by the United States of America.

In the middle of the 1960's, first and foremost, the joint work in space, in the direct sense of this word, became successful, including establishment of various space objectives and their use toward solution of scientific and national economic problems, by the combined efforts of the governments.

For these purposes, in 1964, the west European governments created the European Space Research Organization (ESRO) and the European Launcher Development Organization (ELDO). In 1967, a program of multilateral cooperation of nine socialist states, Interkosmos, was undertaken. The Soviet Union concluded /13 an agreement on cooperation with France. The United States of America, together with conclusion of a number of bilateral agreements on joint experiments in space, proceeded to establishment of an international consortium, for use of communications satellites for commercial purposes, Intelsat.

Provisionally, the picture of international cooperation in space, in the form in which it was put together by the end of the first decade of the space era, could be represented in the following manner: three world centers of cooperation -- Soviet Union, United States of America and western Europe -- with specific interconnections among them. In relations between western Europe and the U.S.A., the complexity of these interrelations was determined by the complete dependence of the Eurpean program on provision of American launch vehicles.

International cooperation in scientific research in space was most advanced of all. "It is completely obvious," as the French scientist J.-P. Cause correctly noted, "that scientific research has found the most favorable environment for its development, since there are fewer obstacles here than in other fields, and also because there is an ancient tradition of international cooperation in science."[3]

At the beginning of the 1970's, important international agreements were signed, in the fields of practical application of space research: an agreement on creation of an international space communications system and organization, Intersputnik, and permanent

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[3]Jean-Pierre Cause, La cooperation internationale dans le domaine de l'astronautique [International Cooperation in the Field of Astronautics], 1971, Mineo. p. 3.

agreements on Intelsat. The shift in the direction of practical use of space technology has been reflected in discussion of a number of other programs and projects of international agreements, for example, an agreement on development of the European-American Aerosat system, for aircraft traffic control, as well as a satellite system for maritime navigation.

In recent years, scientific and technical cooperation of the socialist countries and cooperation of the Soviet Union with India, France, Sweden and other countries have become deeper and more varied. The agreement mentioned, on cooperation in exploration and use of /14 space for peaceful purposes between the USSR and U.S.A., is of great importance.

Together with a tendency towards development and deepening of bonds between governments in the study and mastery of space and toward the penetration of space activity into different spheres of technical and economic life, an opposite tendency is appearing distinctly in the capitalist world, towards disengagement and competition.

For a number of years, "Eurospace" was in a state of permanent crisis, unable to reconcile the contradictory interests of its partners. Conflicts have arisen repeatedly between the countries of western Europe and the U.S.A.

The contemporary picture of cooperation in space overall is a certain resultant synthesis of differing approaches and aspirations of the governments, composed of coincident and opposing forces and tendencies.

The strengthening and expansion of international cooperation in the mastery of space depends on the general state of political and other relationships between governments, but, in turn, cooperation is a powerful lever for improvement in these relationships. It belongs to one of the movements directed forward on the path to durable peace between peoples, which the General Secretary, Central Committee, Communist Party of the Soviet Union, Commrade L. I. Brezhnev, listed in a speech to the World Congress of Peace-Loving Forces: "This is the development of economic, scientific and technical and cultural cooperation, on a basis of complete equality, mutual benefit, without any discrimination or efforts to intervene in the internal affairs of one another."[4]

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[4] Kommunist 15, 21 (1973).

2. The Role of Law in Development of Cooperation.

Scientific and technical cooperation in the mastery of space is closely bound to working out the legal foundations, the international laws, by which we must be guided in performing activities in space. It is not accidental that, within the framework of the UN Committee on the Use of Space for Peaceful Purposes, two subcommittees have /15 been established, scientific-technical and juridicial, which permit this important UN organ to engage in examination of both programs of cooperation and political and juridicial problems, arising in the process of putting them into practice.

The interdependence between cooperation and legal policies in space can be followed, with the example of the origin of the fundamental principle of modern space law, freedom of exploration and use of space, the law of free access to space for all governments.

For centuries, in theory and in practice, international law has confirmed the principle of sovereignty, the unlimited rule of governments over their territories, including its dry land, water and aerial parts. With the appearance of aviation and aerial communications, the question of extension of territorial command of the states into the airspace and, practically, of the right of governments to forbid flights of foreign aircraft and other flight vehicles over their territory, became especially acute.

Even before World War I, a number of governments unilaterally declared the extension of sovereignty into the airspace above their territories and, beginning with the Paris convention of 1919, the principle of complete and exclusive sovereignty of governments over their airspace was secured in the number of multilateral, international treaties, and it became the cornerstone of airspace policy.

However, the upper limit of the airspace of the governments or, to say it another way, the altitude limit of government sovereignty, has never been established by anyone. The call letters of the first satellites, resounding from space, were reminders of the existence of this unresolved international legal problem. The problem became particularly practical: Does not a satellite over the territories of foreign countries infringe on state sovereignty? Is preliminary agreement of these countries required for each fly-over, similar to that which is necessary in flights of foreign aircraft?

Discussion of this question became the initial point of origin/16 of a new field of law, the very name of which initially caused lively arguments. Various authors called it "extraterrestrial," "astronautical," "interplanetary," "interstellar," and even "meta-law," until finally the now universally accepted term "international space law" was approved.

The overwhelming majority of the authors were unanimous that satellite flights above the territories of foreign governments do not infringe on the authority of these governments over their airspace, and that access to space, for the purpose of peaceful exploration and mastery of it, must be open to all countries of the world, on an equal basis, without any discrimination.

The universal and rapid acknowledgement of this principle contributed to a fairly large extent to the circumstance that the space era began in the period of accomplishment of the International Geophysical Year, a program of international scientific cooperation, unprecedented in its scope. A special committee on conduct of the IGY adopted a resolution, as early as 1954, in which the great scientific interest in experiments, using research rockets and satellites, was noted. Although the IGY program was not officially of an intergovernment nature, it was conducted with the active support and approval of the governments.

However, of course, a still greater part in acceptance by governments of the freedom of space was played by the recognition of the historical importance of the breakthrough of man into space and of those capabilities which resulted in this connection, for the scientific and technical progress of all people and the strengthening of international cooperation.

Therefore, in distinction from the principle of freedom of the high seas, which came to replace the centuries-old claims to supremacy over the seas (we recall, for example, how the huge Middle Ages naval powers, Portugal and Spain, on the basis of a number of treaties and papal bulls, divided the waters of the Atlantic, Pacific and Indian oceans between themselves in the 15th century), the principle of the freedom of space was immediately approved in international relations, initially by the silent agreement of the governments and, then, in the form of the resolution of the UN General Assembly and, finally, of a multilateral international treaty.

In his time, K. Marx wrote that the open sea is the "common high road of all nations."[5] In our time, space also has become such a common road, along which Soviet people first passed. /17

However, as frequently happens in life, solution of one problem gives rise to several new ones.

Universal acknowledgement of the situation that state sovereignty did not extend to space immediately raised the question of where the airspace, constituting part of the territories of the governments, ends and where space begins, access to which is open to

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[5] K. Marx and F. Engels, Coch. [Papers], Vol. 15, p. 439.

all governments. Despite the mountain of literature written on this question and its discussion over many years in various international and national organizations, it has not yet been decided.

The scientific and technical subcommittee of the UN Committee on Space was forced to note in its report, that it is impossible at the present time to establish scientific or chemical criteria, which would permit an exact and reliable definition of space to be given and, thereby, to establish the boundary between space and airspace.

The law went the way of regulation of space activities, avoiding a definition of the space itself in which they go on. However, the problem of delimitation (demarcation) of the airspace of governments and space may again become acute, since multipurpose space systems should appear in the near future, something of hybrids of aircraft and spacecraft, which will accomplish flights in both space and airspace.

The second basic problem, which has arisen before the lawyers, as a result of acknowledgement of the principle of the freedom of space, in the absence of special international agreements on space, consisted of the fact that either some standards of law generally are in effect in space or it is some sort of a "legal vacuum."

This was not an idle question. Hotheads among the political and military figures in the West nurtured plans for extensive military /18 use of space and for placement of mass destruction weapons in orbits around the earth and on the moon.[6] The needed a completely free hand for this.

The Soviet legal science categorically rejected the theory of a "legal vacuum," from the very start.[7] The nonextension of the sovereign power of governments to space does not abolish the effect of the general principles of international law in it, which are obligatory for relations between governments, regardless of where their activities are accomplished, on the high seas, in the airspace or in space.

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[6]The American lawyers S. Lay and H. Taubenfeld present a list of 23 military space programs of the U.S.A. (S. H. Lay and H. J. Taubenfeld, The Law Relating to Activities of Man in Space, Chicago-London, 1970, pp. 199-200).

[7]This point of view was expressed first in Soviet literature by the founder of the Soviet science of space law, Ye. A. Korovin. See Ye. Korovin, "International Space Policy," Mezhdunarodnaya zhizn' 1, 74 (1959).

Special rules worked out by the governments, in conformity with the policy for each of these spaces, only define more precisely, develop and make specific the general principles of international law, among which are the prohibition of aggression and war propaganda, nonintervention in the internal affairs of governments, maintainance of territorial integrity and sovereignty of the states, etc.

The authority of the governments over their citizens, or the so-called personal jurisdiction, is preserved in space.

In this manner, in space, even before working out a special legal policy, both intragovernment and international laws were enforced.

The conclusions of lawyers as to the extension of international law into space was first confirmed authoritatively in the resolution of the UN General Assembly in 1961 and, later, in the Declaration of Legal Principles Regulating the Activity of Governments in Exploration and Use of Space, also adopted in the form of a UN General Assembly resolution in 1963.

Nevertheless, space law, as a specialized system of judicial /19
standards or a separate field of international law continued for some time to exist mainly in the minds and works of scholars. Some of the western lawyers were so much carried away and went so far, that they were occupied with discussion of legal standards, by which people should be guided in encounters with representatives of extra-terrestrial civilizations. In this connection, an American lawyer correctly noted that some of his colleagues "are already in orbit, and they are flying very fast and at a very high altitude," and he called on them "to return to earth as quickly as possible."

As a reaction to this type of enthusiasm, another extreme arose; the space law negativists arose, thinking the working out of legal problems of space policy and of laws, by which states should be guided in mastery of, to be premature.

However, the necessity of such laws in the practice of international relations was dictated by life itself, by the requirements for development of international cooperation in space research and of elimination of threats of extending the nuclear arms race into space.

There were completely specific practical problems awaiting answers. Does a government bear responsibility for physical and other damage, which its spacecraft might cause to people and property of another government? Is a government obligated to give aid in rescue of people and return of space objects of another country? Does the formerly recognized international law of title of the so-called initial possession of territory extend to the moon and other celestial objects? Does a government have the right to create

military installations on celestial objects and to place mass destruction weapons in orbit around the earth?

The list of such questions could be continued. Those of them, which yesterday still appeared to be not urgent and speculative, unexpectedly acquired acuteness and were extensively discussed in the pages of the world press.

This process, the continual generation of new legal and political problems in the mastery of space, continues today, even after the /20 adoption of a number of agreements on space by the governments.

Is there enough room in space for all governments?

At first glance, the question appears to be senseless. However, specialists even now are becoming seriously thoughtful over the manner in which it is most advisable and proper to place the satellites of different countries in geostationary orbit, which is of the greatest interest for communication, navigation and other practical-purpose satellites and, moreover, are a limited natural resource, since only a definite number of satellites can be placed in this orbit without mutual interference.[8]

Can a government have available information on natural resources of other governments, obtained by means of satellites, available for inspection?

Can direct television broadcasting through satellites to territories of other governments be conducted without their agreement?

Such questions are being asked by today's space technology. This confirms once again how tightly interwoven problems of a scientific-technical and political-legal nature are in international life, requiring the coordinated actions of the governments for their solutions.

The legal policy of the high seas has been worked out over a period of centuries and airspace policy, over decades. The history of space law, like the history of space research, is counted only in years.

1967 was a turning point, when, on the initiative of the Soviet Union, after prolonged discussions in the United Nations organization, a Treaty on the principles of the activities of governments in exploration and use of space, including the moon and other celestial

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[8]The World Administrative Radio Conference on Space Communications, which met in Geneva in 1971, was occupied with consideration of this question.

bodies, was signed. The signatures of about 100 governments are on this Treaty, which came into force 10 October 1967.

The special importance of this Treaty, which is abbreviated 1967 Space Treaty in legal literature, consists of the fact that, for the first time, the most general international rules of exploration/21 and use of space, written in the form of a treaty, i.e., of a document having, in accordance with international law, obligatory effect for the governments, was reflected in it in systematized form. The answers to several of the questions mentioned above were first given in the Treaty on Space.

Theoretical problems of space law continue to be widely discussed today by national and international public organizations, as well as by individual specialists in many countries of the world.[9] The center of practical development of space law standards from the very beginning has been the United Nations Organization, in particular, the legal subcommittee of the UN Committee on Use of Space for Peaceful Purposes.

Following the Treaty on Space, the Agreement on Rescue of Astronauts, Recovery of Astronauts and Recovery of Objects Launched into Space (1968) and the Convention on International Responsibility for Damage Inflicted by Space Objects (1972) came into being here. Today, new international agreements, developing and making specific the position of the Treaty on Space are being worked out.

The process of bringing the new field of international law, space, into being is proceeding far from painlessly and smoothly. Science, technology, law, politics, cooperation and ideological conflict in the world arena are interwoven into a single unit here. Therefore, years of intense work of lawyers, diplomats and scholars of many countries are being spent in working out international regulations, which sometimes appear to be simple and most reasonable in themselves. Nevertheless, the path from the theory of a "legal vacuum" to creation of a specialized system of standards, defining the legal policy of space itself and the interrelations of governments in mastering it has been successfully traveled in a short time.

Freedom in exploration and use of space by all states, non- /22
appropriation and demilitarization of celestial bodies, nonplacement of mass destruction weapons in space, the international responsibility of governments for their space activities, the obligation of governments to give assistance to astronauts and spacecraft suffering disasters -- these and other principles have become indisputable truths of modern space law.

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[9] In one of the bibliographies on space law, published in 1965, there are references to 6400 works, published in 55 countries (Legal and Political Implications of Space Research: A Selected Bibliography of Eastern and Western Sources, Hamburg, 1965).

The development of international space law is proceeding now from the general to the particular: from general principles of exploration and use of space to standards, regulating individual types of purposes of activity, such as the use of artificial earth satellites for communications, meteorology, navigation, study of natural resources, and definition of the legal policies of the moon and permanent orbital stations.[10]

In the 1967 Space Treaty, it is stated that exploration and use of space must be accomplished "for the good and in the interests of all countries" (Article I). This principle flows from the interest of all countries in mastery of space, regardless of the extent of their economic or scientific development, and it assumes that the results of space research ultimately should belong to all mankind.

Article III of the Treaty reads that governments performing their activities in space must be guided by the interest of maintaining peace, safety, and development of international cooperation and mutual understanding.

The aspiration for assisting to the maximum in compreshensive development of international cooperation in space by the states is stated in many articles of the Treaty and in other agreements, which constitute the foundation of international space law.

Resting on these statutes, Latin American lawyers, in their seminar on teaching space law, which took place in August 1972 in /23
Buenos Aires, approved a declaration, in which international cooperation in space proclaimed the obligations of the governments.[11] However, despite all the good intentions of the authors of this declaration and their desire to assist in development of cooperation to the maximum extent, one can hardly agree with the conclusion on cooperation in space research as an obligation of governments.

Cooperation in general is a concept considerably broader and more capacious than the legal categories "law" and "duty." It goes far beyond the framework of these categories. In space, international cooperation is a necessary condition for successful joint activity in mastery of space, and creation of favorable possibilities for development of such cooperation is one of the principal tasks of space law.

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[10] In particular, in discussions of the United Nations Organization in recent years, the Soviet Union has presented two new plans for agreements on space: "A Treaty on the Moon" (see Pravda, 9 June 1971) and "A Convention on the Principles of Use of Artificial Earth Satellites by Governments for Direct Television Broadcasting" (see Pravda, 11 August 1972).

[11] See "Ensenañza del Derecho Internacional" [Teaching International Law: UNESCO--UNO], Buenos Aires, 1972, p. 81.

Cooperation as a legal concept is a general principle of the relationship between states, the fundamental basis of space law. In practice, this principle involves several laws and duties of a general nature, which are directly mentioned in the Treaty on Space (for example, the duty of taking the appropriate interests of other states into consideration, in performing activities in space, of not creating potential harmful interference in the activities of other states, of assisting in mutual understanding and strengthening friendly relationships between space and peoples, etc.).

More specific laws and duties of states in cooperation can be defined, only by specially concluded agreements on accomplishment of joint projects and programs involved in the mastery of space.

Reduction of international cooperation in space to absolute duty would be a simple play on words in the best case and, in the worst, could inflict damage on states, by requiring them to participate in any joint work in space, even against their direct interests.

The scientific and technical progress and cooperation of the governments engendered in the legal sphere of space law emerges in turn in the role of an important means of development of international scientific and technical cooperation. The effect of the law on scientific and technical cooperation is expressed, first, in the creation of a common space legal policy, guaranteeing the most favorable conditions for development of cooperation of the governments and, second, in formulation and regulation of specific laws and duties of the governments, in performance by them of joint space activities. /24

International projects and programs of joint work in space, which is the question in this book, takes the shape of international agreements, which are integral component parts of modern space law.

CHAPTER 2 /25

PLANS FOR COOPERATION IN SPACE

1. Interkosmos Program

Ten international artificial earth satellites, a series of meteorological and geophysical rockets, a number of successfully completed operations in the field of space physics, meteorology, communications and medicine are only some of the results of joint work of the scientists of nine socialist countries, which have joined in execution of a program of multilateral cooperation called Interkosmos.

The birth of this program was in 1965, when, on the initiative of the Soviet Union, there was an exchange of letters between the heads of the governments of the socialist countries, relative to the study of possibilities of joining forces in exploration and use of space for peaceful purposes. In accordance with the understandings reached as a result of this exchange of letters, in November 1965 and in April 1967, there were meetings of representatives of Bulgaria, Hungary, GDR [German Democratic Republic], Cuba, MNR [Mongolian Peoples Republic], Poland, Rumania, the Soviet Union and Czechoslovakia, at which the content, form and direction of cooperation in space was discussed, with the scientific and technical capabilities and scientific schools established in the individual countries taken into consideration.[12]

On the basis of the offer of the Soviet Union to make Soviet rocket-space technology resources available for joint work, the principal attention was given to study of the possibilities of development of scientific equipment for satellites and research rockets in the socialist countries.

The meetings concluded with the adoption of agreed documents, which were approved by the governments of the countries participating in the talks.

One of the documents contains a multilateral program of co- /26
operation in study of the physical properties of space, space communications, space meteorology and space biology and medicine, which was approved at the meeting. As a result, this program (at the time of a meeting in 1970 in Breslau of the leaders of the national coordinating bodies of the countries, participants in

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[12] See Pravda, 24 November 1965 and 16 April 1968.

the cooperation) received the official name of the Interkosmos program.

In each of the nine cooperating countries, it was decided to create a national coordinating body, responsible for execution of agreed programs, as well as of bilateral and multilateral agreements on individual projects and subjects, which might be concluded within the framework of this program.

In a majority of the countries, the coordinating bodies were formed by the academies of science or ministries of science and technology, and they are headed by outstanding scientists and government figures. In the Soviet Union, the Council on International Cooperation in the Field of Exploration and Use of Space, of the Academy of Sciences, USSR (Interkosmos Council), created in 1966, for coordination of international work on cooperation in space, performed by various ministries, departments, scientific institutions and industrial organizations of the Soviet Union, is charged with performing these functions.

Meetings of the leaders of national coordinating bodies, conducted annually, adopt recommendations and decisions for precise definition and development of joint work programs, and on organizational and other practical questions of cooperation.

Current activity in execution of programs and development of new recommendations takes place, within the framework of permanent mixed working groups in four basic areas of cooperation, which consist of scientists and specialists. These groups are guided by the Statute, approved at a meeting of the leaders of the national coordinating bodies in Moscow, on 14 June 1968.[13] Meetings of working groups are conducted as necessary, but at least once a year, /27 alternating in the countries participating in the cooperation.

The working groups can adopt recommendations and decisions. Decisions of a scientific and technical nature become effective immediately, for countries expressing approval of them. Decisions and recommendations on organizational and financial questions require approval of the national coordinating bodies, in accordance with the procedures established in each country.

There are no such attributes of intergovernment organizations in Interkosmos as an international secretariat and a common budget. There is not a single intergovernment constitutive document. Therefore, from the point of view of international law, Interkosmos cannot be considered at this stage as an international, intergovernment organization, in the strict sense of this word. On the other hand,

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[13] See Appendix.

the presence of a specific intergovernment understanding on multilateral cooperation and the existence of the definite international mechanism providing for this cooperation allow us to be considered as a rising international organization or an organization of a special type, which can emerge in international society as an entity, in some cases.

The legal basis of the activity in the Interkosmos program is an intergovernment agreement, achieved by means of exchange of letters between the heads of the governments, final documents ("reports") of meetings of the official representatives of the countries, approved by the governments, and the Statute on permanent joint working groups, adopted by the national coordinating bodies of the cooperating countries.

Successful development of cooperation in the Interkosmos program confirms the viability of its organizational forms, which insure flexibility in putting programs into practice, do not impose financial burdens on countries not desiring to participate in some specific space experiment, for one consideration or another, and simplify the making of decisions by interested countries.

The rocket and space technology resources of the Soviet Union are made available free of charge to its partners in the cooperation. Each country finances that work in the program, which its scientific/28 institutions perform: the building of instruments and devices for satellites and research rockets, the conduct of scientific research work on agreed subjects, etc.

The first joint satellite of the soviet countries, Interkosmos-1, was injected into orbit on 14 October 1969, two and a half years after adoption of the coordinated program. Ten international satellites also have been launched. They are intended for study of the heliophysical and geophysical processes, taking place on the sun, in the atmosphere of the earth and in interplanetary space.

The scientific equipment, built in the GDR, USSR and CzechSSR, for conduct of studies of the ultraviolet and X-ray radiation of the sun and its effect on the atmosphere of the earth, have been installed in three satellites of this series, Interkosmos-1, Interkosmos-4 and Interkosmos-7. Such studies can be carried out only in space, since the terrestrial atmosphere screens these types of radiation from us; they do not penetrate to the earth.

Measurements carried out by the Interkosmos satellites have permitted a new step to be made towards discovery of the mechanism of the origin of shortwave radiation in flares and other active processes on the sun. In particular, the first successful effort to measure the polarization of X-ray radiation during flares was undertaken by the Interkosmos-1 satellite, which casts a new light on their nature and development.

Many important processes in the atmosphere and on the surface of the earth are connected to solar flares. Polarization of the X-ray radiation is evidence that in formation of flares, comparable in power to the explosion of a billion atom bombs, causing disruption of radio communications on earth and magnetic storms and creating a radiation hazard for space flights, powerful, directed fluxes of accelerated electrons play an important part. Investigations by these satellites also have permitted determination that, at an altitude of about 100 km, there is several times less oxygen than was thought earlier.

The launches of "solar" satellites in the Interkosmos program, with a more extensive and improved set of scientific apparatus, will be continued in the coming years, so as to use the growth of solar /29 activity during its 11-year cycle, for a deeper study of gigantic explosions on the sun and development of reliable methods of predicting them.

Study of the physical characteristics of the ionosphere, the electrically conducting shell of our planet, was carried out by the Interkosmos-2 and Interkosmos-8 satellites. Instruments built by scientists of Bulgaria, GDR and Czechoslovakia, were placed aboard these satellites, together with Soviet apparatus.

Stable shortwave radio communications between any point on earth depend on the state of the ionosphere, which changes, depending on solar activity and the time of year and day. A watch of many days by scientific instruments of the ionosphere satellites gave the scientists new information on temperature distribution of electrons on a global scale, and it resulted in the first detection of the equatorial anomaly in the ionosphere, at altitudes of over 900 km. This meant a new step on the way to a deeper understanding of the nature of changes taking place in the ionosphere and timely prediction of them.

The Interkosmos-3 and Interkosmos-5 Soviet-Czechoslovakian satellites were intended for study of the radiation situation in circumterrestrial space, of the radiation belts of the earth and of electromagnetic processes in the ionosphere. Simultaneous geophysical and radiophysical studies were conducted, by means of these satellites. The information obtained filled in our knowledge of sun-earth connections and regularities in propagation of low-frequency waves and the so-called "whistlers" in the ionosphere of the earth.

By a logical extension of work performed earlier, there were joint experiments of scientists of the GDR, Soviet Union and Czechoslovakia, in the Interkosmos-10 satellite, launched 30 October 1973, for the purpose of multiple studies of electromagnetic connections of the magnetosphere to the ionosphere.

The Interkosmos-6 satellite, launched 7 April 1972, differed significantly from its fellows, in its construction and scientific tasks. This was the first satellite of the Interkosmos series returned to earth. A photographic emulsion unit and an ionization

calorimeter, weighing over one ton was installed aboard it; it was intended for study of primary cosmic radiation, and it had to be /30
returned to the hands of the scientists, according to the conditions of the experiment. The same requirement was advanced for a set of equipment, developed and fabricated jointly by scientists of Hungary, Czechoslovakia and the USSR, for study of meteoritic matter.

After landing of the satellite, the photographic emulsion unit was sent to the Joint Institute for Nuclear Research at Dubna for photochemical development. The experimental material obtained was made available to the scientists of six socialist countries, for study, according to the program and methods proposed by Polish and Soviet scientists.

The active participation of scientists of the socialist countries in conduct of experiments on the Interkosmos-6 satellite is a logical consequence of the great interest in study of cosmic rays, which contain information on processes taking place in deep space, and which permit deeper understanding of many astrophysical phenomena. The nuclear photographic emulsion method was used for the first time, to conduct such studies in space.

In 1973, the entire world celebrated the 500th birthday of the great Polish astronomer, Nicholas Copernicus. The launch of the Soviet-Polish Kopernik-500 satellite was timed for this date. Soviet scientists and countrymen of the great astronomer of ancient Torun worked on the instruments for this satellite, studying the sporadic radio radiation of the sun and the ionosphere.

The Interkosmos satellites are serviced by the command-measurement complex of the Soviet Union. Operational-technical management groups are created, for control of the operation of the scientific equipment, which includes specialists of the countries participating in the experiment. The data from the measurements made by the satellites are transmitted for processing and analysis, to the scientific research institutes of the corresponding countries.

At the present time, only a portion of the primary information transmitted from the satellites is used directly in the territory of the cooperating countries. A unified satellite telemetry system (USTS), now being developed by the specialists of a number of countries, together with the ground receiving stations, will soon permit all the cooperating countries to receive and record /31
scientific information coming from the instruments installed in the satellite "at home." This expands the capabilities of active participation of specialists of the socialist countries in conduct of experiments and acceleration of the processing of scientific information.

The characteristic feature of the experiments in the Interkosmos program is their complex nature. Measurements aboard the satellite are combined with extensive ground observations, carried out according to the agreed program. The first experience in such

complex studies was gained in 1968, when the Kosmos-261 satellite was launched; the upper atmosphere and the nature of the Aurora Borealis were studied by means of it.[14]

With launch of "solar" satellites, the activity of the sun was studied simultaneously by instruments placed in the satellites and by ground observatories. Ionospheric research and study of low-frequency electromagnetic oscillations conducted by the satellites, also were accompanied by measurements by an extensive network of geophysical observatories and ionospheric stations located in many countries.

Experiments conducted simultaneously aboard satellites and at ground stations and observatories require clear and well-coordinated work of many groups of scientists, well set up systems of notification and compilation of the data obtained. The global nature of the phenomena studied also make such efforts completely justified.

Together with satellite studies, the Interkosmos program includes experiments, performed by means of meteorological and geophysical rockets. Such experiments make it possible to obtain characteristics of the vertical profile of the atmosphere, including altitudes at which satellites cannot exist. Rocket research data serve as a natural supplement to the satellite data.

At the end of 1970, the powerful Vertikal'-1 geophysical rocket was launched in the Soviet Union; it was designed to rise to an altitude of 500 km. The scientific apparatus for it was developed and built by scientists of six socialist countries. The tasks of /32 the experiment included measurement of a number of structural parameters of the ionosphere and solar radiation, and study of the physical and chemical properties of meteorite particles. The total weight of scientific and service equipment installed in the rocket was 1300 kg. The studies were continued by launch of the Vertikal'-2 rocket in August 1971. Simultaneous ground measurements of radio-wave absorption, by means of ionospheric stations of the GDR and USSR, were carried out simultaneously, in the launch area of the rocket.

Scientists and engineers of the sister socialist countries undertake the most direct participation in all stages of work with satellites and rockets: from planning and building scientific equipment to its prelaunch tests at the spaceport. Each new scientific experiment is the result of the creative work of large groups of scientific institutions and industrial enterprises of various countries.

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[14] See "Storms in the Circumterrestrial Plasma" (cooperation of the astrophysicists of the socialist countries)," Pravda, 27 April 1969.

Satellite and research rocket launches in the Interkosmos program will continue in the coming years. Some of the experiments, requiring accumulation of data for statistical processing, will be repeated, and others will be performed for the first time. The Soviet Union is making available to its partners new, more nearly perfect rocket and space technology resources.

The most urgent problems and specific experiments, within the framework of the working group on space physics, are defined directly by the interested scientists of the cooperating countries. The permanent working group on space physics has formed a number of subject sections: upper atmosphere, magnetosphere, the sun and sun-earth connections, cosmic rays, the moon, planets, and solid components of interplanetary matter, scientific research by means of observations of artificial earth satellites, telemetry and electronics and data processing.

The sections meet, both simultaneously with the annual meetings of the working group and independently. They analyze the overall state of research in the appropriate field, propose scientific research subjects and specific experiments in the Interkosmos program, and also discuss the scientific results obtained.[15] As a result of/33 careful analysis and selection carried out by international groups of scientists, the satellite and rocket experiments and scientific research work in the Interkosmos program for the coming years have been determined.

Joint work in the field of space physics is not limited only by direct measurements from aboard satellites and rockets. Coordinated observations by observatories and ionosphere stations are accomplished, joint theoretical work is successfully carried on, and scientific meetings and discussions are systematically organized. The laboratories of several socialist countries are participating in analysis of lunar soil samples, returned to earth by soviet unmanned spacecraft.

As early as 1957, joint work was begun by scientists of the socialist countries, in optical observations of artificial earth satellites (visual, photographic and photometric). These observations, which fully preserve their importance today, permit study of the density of the atmosphere at the satellite perigee altitude and irregularities in the terrestrial gravitational field, establishment of geodetic interties at great distances, carry out ephemeris service needed for prediction of satellite motions and control of

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[15] See B. N. Petrov and M. G. Kroshkin, "Space physics and cooperation of the scientists of the socialist countries," Vestn akad nauk SSSR 4, 76-84 (1972).

the operation of their scientific equipment.

Special satellite photographic observation stations, equipped with soviet AFU-75 cameras, have been established in the territory of a number of the cooperating countries, at observatories or universities. Such stations are now operating successfully in eight countries. To increase the accuracy of satellite observations, specialists of the Soviet countries have jointly established laser rangefinder units, which have been placed at some of these stations. The annual, Observations of Artificial Earth Satellites, has been published since 1963, in which scientific articles, accounts of the work of stations and a chronicle of scientific meetings are published.

Initially, this work was performed on the basis of bilateral agreements. The experience accumulated allowed a change, beginning/34 in 1962, to multilateral, cooperative observation of artificial satellites, which resulted in the capability of accomplishing more complicated scientific research programs, requiring the coordinated work of observation stations of many countries. The first coordination meeting of the Commission on Multilateral Cooperation Between the Academies of Science of the Socialist Countries met on this problem in Leningrad, in 1962. Coordination meetings and scientific conferences have been carried out at least once a year since that time, alternately in different countries participating in the cooperation. Since 1969, this work, the direction of which in the Soviet Union is carried out by the Astronomy Council, Academy of Science, USSR, has been an organic part of the Interkosmos program.[16]

Satellites and rockets, as well as the scientific research projects connected with them, constitute a nucleus, the core of the Interkosmos program. However, the goals which the cooperating countries set themselves are much more extensive. They include tasks, not only in study of space, but in practical use of the achievements of astronautics.

The growth of astronautics in the socialist countries is closely bound to solution of these problems. They occupy a prominent place in the activities of the permanent working groups on space communications, space meteorology and space biology and medicine, established, in accordance with the Interkosmos program.

On 15 November 1971, Bulgaria, Hungary, GDR, Cuba, Mongolia, Poland, Rumania, the Soviet Union and Czechoslovakia signed an Agreement on establishment of an international system and Intersputnik

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[16] See A. G. Masevich and N. P. Slovokhotova, "Scientific research by means of observations of artificial earth satellites," Nablyudeniya iskysstvennykh sputnikov Zemli 7, 205-213 (1967 (1968)), Sofia.

space communications organization. Technical, economic and legal problems in establishment of Intersputnik were discussed and prepared in meetings of the working group on space communications.[17]

The meteorological services of the socialist countries taking an active part in accomplishment of the Interkosmos program are /35 carrying out joint studies, using meteorological satellite and rocket data. The studies are of a purposeful nature, and they are providing a higher level of activity of the forecast centers of the socialist countries.

In the field of satellite meteorology, the cooperating countries are now changing from joint development of methods of interpretation and use of data from meteorological satellites to practical use of this data, by numerical analysis and weather forecasting. The complexity of these problems, occupying a central position in world meteorological science, require the combined efforts of many countries. Scientific groups of the cooperating countries are working to build improved onboard and ground equipment.

Joint work on atmospheric sounding by meteorological rockets also is devoted to study of the regularities in processes taking place in the upper layers of the atmosphere and having practical value for the weather service. Much attention is being given here to development and improvement of technical sounding means and to development of instruments and devices.

Thus, specialists of the GDR meteorological service have fabricated mylar shells and metallized reflectors, for measurement of the wind speed at altitudes below 90 km. They were successfully tested during launches of Soviet meteorological rockets. A group of Soviet and German scientists has conducted experiments, to measure the concentrations of ions and electrons in the upper atmosphere, at the rocket sounding station in Volgograd, using Soviet rockets and instruments made in the GDR.

Development of a set of ground apparatus is being carried out by the combined efforts of specialists of a number of countries, to receive data from meteorological satellites in the direct transmission mode, which permits the meteorological services of the socialist countries to receive information of interest to them in their territory and to use it in a more operationally important way for compilation of weather forecasts.

One of four component parts of the Interkosmos program is joint work in the field of space biology and medicine, which is being conducted in 21 selected subjects. This work includes problems of

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[17] See Chap. 5 for greater detail on Intersputnik.

space physiology, radiation safety of space flights and pharmaco- /36
chemical protection from ionizing radiation. Interest in conducting such work on an international basis is explained by its theoretical and practical importance, not only to insure safety of flights of the astronauts, but for development of aviation medicine and regular "earth" biology and medicine, including measures for prophylaxis and treatment of various diseases.

The successes achieved by scientists of the USSR and other socialist countries in the field of general biology and medicine have served as a good basis for development of this cooperation. The combination of the resources of different scientific institutions, each of which has its specialty, its experience and perfected methods of study, is proving to be very fruitful. In the course of the cooperation, specific results have been obtained, there are jointly published scientific articles and new research apparatus has been created.

The cooperation of the socialist countries in the Interkosmos program, in this manner, encompasses the entire spectrum of space research and its practical applications, and it occupies one of the central positions in international programs of study and mastery of space.[18]

There is definite practical interest in certain legal questions of the Interkosmos program. As has already been noted, Interkosmos is not an international, intergovernment organization at this stage, since it does not have a number of the necessary characteristics inherent in such organizations. Of course, this does not eliminate the possibility of institution of an intergovernment organization, when the participants in the cooperation deem it advisable.

In international agreements, which strengthen the foundations of modern space law, the question is mainly on two types of space activity of governments: those carried out on a national basis and those being conducted within the framework of international, inter- /37
government organizations. The question arises: Are the principles and standards of general space law applicable to the present activity in the Interkosmos program?

In Article XIII, Treaty on the Principles of the Activities of Governments in Exploration and Use of Space, Including the Moon and other Celestial Objects, which went into effect on 10 October 1967, it is said that the provisions of the Treaty are applied, with

[18] On the Interkosmos program, see also Horst Hoffman, "Cooperation and Integration of the Socialist States in Space Research," Astronomic in der Schule," 2, 28-33 (1972); B. N. Petrov, "Interkosmos in action," Pravda, 16 October 1970; V. S. Vereshchetin, Kosmos i mezhdunarodnoye sotrudnichestvo [Space and International Cooperation], Znaniye Press, Moscow, 1971, pp. 4-14, and others.

respect to the activities of governments, "regardless of whether such activity is accomplished by one state, a participant in the Treaty, or together with other states, including work within the framework of international, intergovernment organizations."

The word "including" gives a basis for considering that the activity, within the framework of international, intergovernment organizations is considered as only one of the forms of joint activity contemplated by the Treaty, and not as the only form. Consequently, multilateral cooperation within the framework of the Interkosmos program also falls into the category of joint activity, which is spoken of in Article XIII of the Treaty.

There is a reference to joint activity in Articles V and XVII, of the Convention on International Responsibility for Damage Inflicted by Space Objects.

Cooperation of the states in the Interkosmos program is one of the types of joint activity contemplated in agreements on space, and the principles and standards of space law secured in these agreements are applicable to it.

It flows from this, in particular, that each of the governments participating in the Interkosmos program, in the course of accomplishing it, may turn out to be legally involved with third governments, not participating in the program. Such a situation can arise, for example, if an Interkosmos satellite inflicts damage to persons or property of a third government not participating in the program. By virtue of Article V of the Convention on International Responsibility for Damage Inflicted by Space Objects, in such a case, countries jointly conducting a launch have joint responsibility for the damage inflicted, and the victim government may require com- /38
pensation for the damage from all of these governments, or from each of them separately.

Of course, in the case we are considering, joint responsibility should not be borne by all governments cooperating in the Interkosmos program, since there is no monetary fund for accomplishing this program, but only those of them, who directly participated in the specific launch, for example, by means of fabrication of all or part of the onboard equipment of the satellite, or by means of provision of the launch installations and launch vehicles.

Nevertheless, such responsibilities, flowing from the space law standards in effect, can require conclusion of a special agreement between governments cooperating in the Interkosmos program at some stage, relative to distribution between them of financial obligations, from which international responsibility may arise.

Legal relationships with third states can arise with any of the participants in the Interkosmos program, also in connection with Article VIII, of the 1967 Treaty on Space, in which, in particular, it is said that the property law on space objects launched into space

remain unaffected, during the time they are in space, on a celestial object or upon return to earth.

The owners of scientific apparatus installed on Interkosmos-series satellites are the governments which produced the corresponding apparatus. A breach of their laws, on the part of any state, may entail the generation of specific legal relationships.

In the Agreement on Rescue of Astronauts, Return of Astronauts and Return of Items Launched into Space (Article V), the right of states, which bore expenses in performance of their duties to discover and return a foreign space item is provided for, and it requires reimbursement for these expenses by the state or international organization launching this item. In cases of a joint launch, the state reimbursing such expenses should obviously have the right to require reimbursement of the appropriate fraction of /39 the expenses borne from the remaining participants in the joint launch.

With the passage of time, special understandings may be required between states working jointly in the Interkosmos program, relative to the procedure for registration of their common satellites, since space law connects important legal consequences to the act of registration, including the international responsibility of the governments. The necessity may arise for legal regulation of a number of other questions, for example, patent rights and copyrights.

Thus, in accordance with the space laws in effect, in the process of accomplishing the Interkosmos program, legal relationships can arise, not only directly between participants in the program, but also between them and third governments.

The absence of an intergovernment organization, in the traditional sense of this word, which would be engaged in putting the Interkosmos program into practice, is not an obstacle to regulation of these relationships. Whether joint space activity is accomplished within the framework of intergovernment organizations or outside them, a number of legal questions, arising in the course of the joint activity, can require special agreements and understandings between the participant countries, as well as between them and third countries.

In some cases, Interkosmos now can independently enter into international relationships. Article XI of the 1967 Treaty on Space provides for the desirability of informing the General Secretary of the UN, the public and the international scientific community, "to the maximum possible and practical extent," of the nature, course, locations and results of activities in space, including the moon and other celestial bodies. The right of Interkosmos to be a representative to sessions of the UN Committee on the Use of Space for Peaceful Purposes, at conferences and congresses of COSPAR, to the International Federation of Astronautics and to other international scientific forums, having both an intergovernment and a nongovernmental nature, flows from this.

Further expansion of contacts in this area will facilitate greater coordination of international programs on exploration and use of space and the development and deepening of international scientific and technical cooperation. /40

The joint space research program, successfully accomplished by the nations of socialist cooperation, reflects a high level of science and technology in these countries, and it is one facet of socialist integration.

2. Bilateral Programs of Cooperation of the Soviet Union

USSR-U.S.A.

The condition and prospects of international cooperation in mastery of space depends to a considerable extent on the development of ties in this area between the two leading space powers, the Soviet Union and the United States of America. Although the first contacts between scientists of the USSR and U.S.A. were established at the very beginning of the space era, when they were reduced mainly to joint discussion of scientific results obtained in various international conferences and meetings.

The first bilateral agreement between the USSR and U.S.A. was concluded on 8 June 1962, by the USSR Academy of Sciences and the U.S.A. National Aeronautics and Space Administration (NASA). It subsequently was supplemented by an agreement between these same institutions on 8 October 1965, relative to preparation and publication of a joint work on space biology and medicine.[19]

In accordance with these agreements, some joint work was carried out in the middle of the 1960's, by scientists and specialists of the USSR and U.S.A. A direct communications channel has functioned between the world meteorological centers and institutions in Moscow and Washington since 1964. Information on the state of the atmosphere on our planet, including that obtained from meteorological satellites, which are used operationally by the weather services of a number of countries, is transmitted over this channel around the clock. /41

A Soviet-American experiment was performed, in establishment of

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[19] See A. A. Blagonravov, "Cooperation of the USSR and the U.S.A. in space research," Vestn. akad. nauk SSSR 10, 82-84 (1964). For the text of the agreement, see United States International Space Programs, Staff Report Prepared for the Committee on Aeronautical and Space Sciences, United States Senate, 30 July 1965.

communications through space, by means of the Echo-2 passive communications satellite. An exchange was made of the results of measurements, for the purpose of compiling maps of the magnetic field of the earth. Work was begun on writing a joint three-volume work, Foundations of Space Biology and Medicine.

On the whole, cooperation during these years was very limited, and it did not correspond to the scale of the national programs of the USSR and the U.S.A. and their roles in study and mastery of space. A shift in development and deepening of Soviet-American cooperation was noted in 1970-1971, when a number of meetings of scientists and technical specialists of both countries was held, for the purpose of discussion of the possibilities of development of joint means for approach and docking of spacecraft and stations, as well as for cooperation in a broader field of scientific research in space.

In a series of these discussions, the meeting of the President of the USSR Academy of Sciences, Academician M. V. Keldysh, and the Acting Director of NASA, Dr. G. M. Low, held in Moscow on 19-21 January 1971, played an important part. In the summary document signed as a result of these meetings, an agreement was recorded between the USSR Academy of Sciences and NASA, on joint actions, directed toward development of Soviet-American cooperation in space and a procedure for working out the appropriate recommendations.[20] Working groups of specialists of both countries, meeting in Moscow and Washington during 1971, defined the responsibilities of the parties for subjects and projects of mutual interest and, thereby, gave the previously achieved agreement in principle a more specific nature.

All this prepared the soil for conclusion of an Agreement between the Union of Soviet Socialist Republics and the United States of America on Cooperation in the Exploration and Use of Space for Peaceful Purposes, concluded during the visit to Moscow of the President of the U.S.A., R. Nixon. It was signed on 24 May 1972, by the /42 President of the Council of Ministers of the USSR, A. N. Kosygin, and the President of the U.S.A., R. Nixon,[21] and it was one of those agreements which, as Commrade L. I. Brezhnev said, in a speech to the World Congress of Peace-Loving Forces, "Open the way to a change in Soviet-American relationships from confrontation to relaxation, normalization and mutual cooperation."[22]

The agreement, including a period of five years, provides for development of cooperation between the two countries in three main areas: 1) assistance in execution of the understanding between the USSR Academy of Sciences and the U.S.A. National Aeronautics and Space Administration of 21 January 1971; 2) the conduct of work to

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[20] See Pravda, 22 January 1971.

[21] See Appendix.

[22] Kommunist 15, 6 (1973).

create compatible facilities for approach and docking of Soviet and American manned spacecraft and stations; 3) assistance in international legal regulation of space activity.

The understanding, as a result of discussions of questions of cooperation between the USSR Academy of Sciences and NASA of 21 January 1971, mentioned in the Agreement, encompasses a broad region of research of circumterrestrial space, the moon and planets, as well as cooperation on the problems of space meteorology, study of the natural environment from space and space biology and medicine.

The understanding between the USSR Academy of Sciences and NASA provides for coordination of research on these subjects and problems, exchange of the scientific information obtained and, in some cases, accomplishment of joint experiments. For development and execution of the corresponding cooperative programs, a number of working groups were established. We illustrate the nature of the work, which is being conducted, in conformance with the Soviet-American agreement, by several examples.

The USSR Academy of Sciences and NASA are exchanging samples of lunar soil, returned by both countries from different regions of the lunar surface and are jointly discussing the results of the analyses carried out. Specialists occupied in study of the moon have exchanged catalogs of maps and photographs of the moon, are working out a /43 common system of lunar coordinates and are conducting preparatory work for compilation of a complete map of the moon, on a coordinated basis.

During the flight to Mars of the Soviet Mars-2 and Mars-3 interplanetary spacecraft and the American Mariner-9 spacecraft, operational exchange of information between scientists on phenomena of scientific interest recorded was carried out by teletype.

The main results obtained during investigation of Mars and Venus by both countries, as well as prospective scientific research tasks of the planets of the solar system, have been discussed jointly by the leading scientists of the USSR and U.S.A.

Coordinated study of the natural environment from space is being conducted on selected sections of dry land, of each country over its own territory, as well as on the Pacific Ocean. A coordinated program of research on the ocean, by means of research ships and aircraft was accomplished in the eastern Atlantic, in the summer of 1972.

In the field of space meteorology, the parties set up the task of increasing the operational importance of exchange of meteorological satellite data, as well as to report the results of rocket sounding of the atmosphere, carried out according to an agreed program, to each other. Within the framework of cooperation in space meteorology, a Soviet-American expedition to the Bering Sea, designated conventionally as Bering, was organized in February-March 1973. Ships and

aircraft of both countries participated in it. The goal of the expedition was to work out methods of measurement, which would permit regularly obtaining information on the ice conditions, state of the ocean surface and moisture content of the atmosphere in the future, by means of satellites. This information will be of great importance for navigation and compilation of weather forecasts.

The specialists in the field of space biology and medicine have repeatedly met, for joint consideration of materials from medical-biological research, performed during the flight of the Soyuz and Apollo spacecraft, and also of the Salyut and Skylab space stations. Agreed recommendations were worked out on certain methods of pre- and postflight examination of the astronauts. The writing of the /44 three-volume Soviet-American work, Foundations of Space Biology and Medicine, is nearing completion.

Work to create compatible facilities for approach and docking of Soviet and American manned spacecraft and stations occupies a central place at present in the cooperation of the USSR and U.S.A. in space. This is the greatest work, in complexity and scale, ever accomplished, on the basis of bilateral cooperation of the governments in mastery of space. It concerns planning, building and testing of devices, under actual flight conditions, which will permit docking of any spacecraft or orbital station equipped with such technological devices to be carried out, in case of need.

The goal of this work was prompted by the desire of both countries to insure the safest condition for manned space flights and to create the technical capabilities of coming to the assistance of one another in an emergency situation. The creation of compatible facilities also opens the way to future conduct of joint scientific research by astronauts of different countries.

On the basis of the general principles and coordinated technical requirements, specialists of the USSR and U.S.A. are conducting the planning and building of facilities for approach of spacecraft and docking devices, which should be initially tested on earth and, in 1975, in a joint experimental flight of Soyuz type Soviet spacecraft and Apollo type American, with mutual transfer of astronauts from one spacecraft to another.

Large groups of specialists, headed by the technical directors of the project, are participating on both sides in accomplishing the project. The governments have appropriated considerable resources for conduct of the work.[23] Accomplishment of the project involves

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[23] NASA has requested $250 million for this work from Congress. About four and a half thousand people are working on accomplishment of the project in the U.S.A. See Hearing before the Subcommittee on Manned Space Flights of the Committee on Science and Astronautics, U.S. House of Representatives, 31 May 1972, U.S. Government Printing Office, Washington, 1972, pp. 25-26.

solution of a whole set of technical and organizational problems.

Taking the experience of each of the countries into consideration, a completely new docking device design, control and /45
communications apparatus, antennas and other equipment necessary for approach and docking of the spacecraft are being created. The Apollo spacecraft will be equipped with a specially developed docking section, an airlock about 2.8 m long and about 1.5 m in diameter, for transfer of the astronauts from one spacecraft to the other.

Execution of the project has required compilation of a detailed graph of the work, preparation of a large volume of coordinated technical documentation, creation of models of conduct of ground experiments and joint training of the flight crews and flight control center personnel.

Regular meetings of technical specialists and astronauts of both countries have been going on in Moscow and in the NASA Manned Space Flight Center in Houston since October 1970, for the purpose of coordination of technical and organizational problems arising in execution of the project. Permanent mixed working groups of specialists, maintaining constant contact among themselves, have been formed in each of the areas of work.

In accordance with the agreed flight program, the Soviet Soyuz spacecraft, with two astronauts aboard, will be launched first, in July 1975. Seven and a half hours later, the Apollo spacecraft will be launched, with three American astronauts aboard. In case of necessity, the American craft can be launched on the second or third day after launch of the Soyuz. A day after the Apollo goes into orbit, the Soviet and American craft will carry out approach and docking, and will form a single manned space system. The joint orbital flight will last approximately two days, during which it is planned to transfer the astronauts from one craft to the other and to conduct certain joint scientific experiments. After undocking, the craft will continue the flight, according to independent programs, and will return to earth.[24]

The names of the Soviet and American astronauts who are pre- /46
paring for the first joint flight are well known. The USSR Academy of Sciences has confirmed four crews for the primary and backup Soyuz spacecraft. First: A. A. Leonov who performed extravehicular activity in March 1965, during the Voskhod-2 flight, and V. N. Kubasov, as flight engineer, who participated in the Soyuz-6 flight in 1969. Second: Colonel A. V. Filipchenko, who participated in

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[24] See B. Petrov, "Soyuz and Apollo: a joint flight project," Pravda, 2 August 1972; K. Bushuyev, "Mutual assistance in space," Nauka i zhizn' 4, 6-15 (1973).

the group flight of three spacecraft as Soyuz-7 spacecraft commander, and N. N. Rukavishnikov, who flew as test engineer in the Soyuz-10 flight in 1971. Third: astronauts Major V. A. Dzhanibekov and B. D. Andreyev. Fourth: astronauts Captain Yu. V. Romanenko and A. S. Ivanchenkov.

U.S.A.F. Brigadier General Thomas P. Stafford has been named the commander of the American spacecraft. He has already been in space three times. The second member of the crew, Vance Brand, was named a member of the American astronaut group in 1966. He was backup commander of the primary unit of Apollo-15. The third crew member, Donald Slayton, has been in NASA since 1959. The composition of the American backup crew has also been determined.

The approach and docking means built by each country, on the basis of common principles and coordinated training, tested under actual space flight conditions, are making manned flight of spacecraft and stations more reliable, from the point of view of their safety, and capabilities are developing for joint work of the astronauts of different countries in orbit around the earth.

With the example of the Soyuz-Apollo project, one can follow how tightly interwoven are law and technology, in the matter of international cooperation in space research.

The Treaty on Principles of Activity of Governments in Exploration and Use of Space, Including the Moon and Other Celestial Bodies contemplates the duty of astronauts of one government to give all possible assistance to astronauts of other governments in performing activities in space (Article V, Treaty).

In order for this provision of the Treaty not to be a dead letter, the States launching spacecraft must equip them with techni/47
cal means, allowing approach and docking of spacecraft of different countries to be carried out, in case of necessity. The Soviet-American understanding, recorded in the Agreement of 24 May 1972 and put into practice in the joint Soyuz-Apollo project, is pursuing precisely this goal.

On the other hand, practical execution of this project is bringing out new international legal questions requiring decisions. In particular, during the experimental flight of the Soyuz and Apollo spacecraft, they will be docked for a period of two days, forming a kind of international orbital station. In connection with this, questions arise as to the legal status of these stations overall, and of the jurisdiction, with respect to the crews in them, in particular, during the transfers of the astronauts from one craft to the other. These questions may be of not only theoretical, but practical importance, when applied to the interrelationships between the spacecraft crews and the ground control centers of the two countries, and they may be solved by means of special understandings.

In this manner, law and technology go hand in hand, each with its specific methods of assisting in development of international cooperation.

It was not accidental, in the agreement between the USSR and U.S.A. of 24 May 1972, that, together with articles on scientific and technical cooperation, there is Article 4, providing for assistance by international efforts, directed towards solution of international legal problems of exploration and use of space for peaceful purposes, in the name of strengthening law and order in space and of further development of international space law.

Conclusion of the intergovernment agreement and execution of the Soyuz-Apollo project is a major and important step in development of joint work in space by the two leading space powers, and broad prospects are resulting for the strengthening of international cooperation overall.

USSR-France

The first country of the capitalist world, with which the Soviet Union signed an intergovernment agreement on cooperation in research and mastery of space, was France. There were important pre- /48
requisites for this: an established relationship of trust and agreement between the two countries and the presence in France of a major national space program.

Making available their space centers, developed by the aviation and space industry, rockets, the spaceport in Guiana and the network of satellite tracking stations, France was in third place in the world in scope of space research. Simultaneously, she is carrying out an extensive program of international cooperation, both on a multilateral and a bilateral basis.

The agreement between the USSR and France was signed by the foreign ministers of both governments, on 30 June 1966, during the visit of General de Gaulle to the Soviet Union.[25]

In the Preamble to the Agreement, the importance of study and mastery of space for peaceful purposes is emphasized, and it is noted that cooperation between the USSR and France in this field responds to the spirit of the traditional friendship between the Soviet and French peoples and will facilitate further expansion of cooperation between the two countries and building up European scientific and technical cooperation.

The governments of both states reached an agreement on preparation and execution of a program of bilateral cooperation and on rendering support and assistance to the interested organizations of both countries for these purposes.

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[25] See Appendix.

The main areas of future cooperation were defined in the Agreement: study of space, including, in principle, launch of a French satellite of by the Soviet Union; space meteorology, using the newest scientific equipment; space communications through artificial earth satellites; exchange of scientific information, apprentices and scientific delegations and organization of conferences and symposiums. According to the mutual understanding, cooperation may be extended to other fields.

A mechanism also was established, providing for development and execution of programs of joint work. It includes mixed working groups, consisting of representatives of scientific and technical /49
organizations, who are given the right to sign working protocols, defining the content and conditions of cooperation.

Scientific information obtained in carrying out joint experiments must be accessible to both parties and be communicated at acceptable times. The first publication rights belong to the authors of the experiment.

The agreement was concluded for a period of ten years, and it terminates, when it is denounced by one of the parties. By mutual agreement of the parties, refinements and supplements can be incorporated into it.

Practical work to put the Agreement into practice is entrusted to the Council on International Cooperation in the Field of Exploration and Use of Space, of the Academy of Sciences, USSR (Interkosmos) and the National Center for Space Research of France (CNES). In each of the areas mentioned, cooperation is established by mixed working groups of scientists and specialists of both countries. Sessions of the working groups take place annually, alternately in the USSR and France. A specific program of joint work, the mutual responsibilities of the parties, times and methods of putting them into practice are fixed in the working protocols.

In those cases when the responsibilities of the parties have a more extensive and prolonged nature, special interdepartmental agreements are included in development of the general Agreement. Sometimes, they are confirmed by exchange of notes between the governments. On these foundations, a special Soviet-French protocol was signed in 1969, relative to organization of joint work in photographic observations of space objects on the Kerguelen Islands (French possession in the Indian Ocean). In 1972, the meteorological services of both countries, together with Interkosmos and CNES, signed an agreement on organization of regular launches of Soviet and French meteorological rockets on the same islands. Together with the rocket launches, carried out by the Soviet Union from the North to the South Poles, they allowed data to be obtained on temperature, winds and other parameters of the atmosphere, along the entire provisional meridan Longitude 60-70° East.

For conduct of joint experiments, various scientific and technical resources are used: from Lunakhods, interplanetary spacecraft

and Molniya communication satellites to meteorological rockets, /50
high altitude drifting aerostats and such ground facilities as radio-telescopes, laser installations and special photographic cameras.

The vital and opportune nature of this Agreement was confirmed by the successful course of execution of it and by the significant scientific results obtained by Soviet and French scientists, in carrying out joint experiments.

In each of the fields of cooperation defined in the 1966 Agreement, important practical results were achieved.

We present only a few examples.

In 1968-1971, Soviet-French experiments were carried out, to study the set of electromagnetic phenomena in magnetically coupled regions of the earth: the Arkhangelsk region and the Kerguelen Islands. The task of the experiments was to study phenomena, connected with perturbations of the magnetosphere and development of the auroras, by means of ground resources and aerostats. A large group of Soviet and French scientists and specialists launched drifting aerostats to altitudes of up to 40 km. Both Soviet and French aerostats and scientific apparatus were used in the course of the experiments.

Valuable information on magnetosphere processes, obtained as a result of these experiments, in particular, permitted study of the picture of the most powerful storms in the magnetosphere of the earth in the current 11-year cycle of solar activity.

A development and continuation of this work, which went by the name of Project Omega, is a new Soviet-French Project Arax, implementation of which is planned for the end of 1974 and beginning of 1975. Its purpose is an effort at an active action on the magnetosphere, one of the manifestations of which may be an artificial aurora.

French Eridan rockets and specially built Soviet energetic electron accelerators will be used in the experiment.

Soviet and French scientists also have studied magnetosphere and ionosphere processes, by means of spacecraft. In 1971 and 1973, the Soviet-French Oreol satellites were launched, in which electron and proton fluxes were studied in the aurora regions and, in the /51
summer of 1972, information on low-energy particles and neutrons, as well as gamma rays of solar origin was transmitted from the Soviet high-apogee Prognoz satellite, by the French Calypso and Neige instruments.

French scientists also made their contribution to study of the moon and planets of the solar system.

French corner reflectors, intended for laser ranging of the moon, were installed on the Soviet Lunakhod-1 and Lunakhod-2 self-propelled vehicles. The reflector is a panel of 14 rectangular prisms, made of a special material, which is resistant to the sharp temperature fluctuations characteristic of the lunar day and night. By means of the reflectors and ground laser installations, the distances between specific points on the earth and the moon can be measured with high accuracy, and the parameters of the orbit of the moon and its shape can be refined, and a number of other geodetic and astronomical studies can also be carried out. Observatories located in the Soviet Union, France and the U.S.A. have already carried out a number of successful operations with these reflectors. Samples of lunar soil, returned to earth by Luna-16 and Luna-20, have been sent to French laboratories for analysis.

A number of French instruments have been installed on Soviet interplanetary unmanned spacecraft. In particular, the French Stereo experiment, to study the structure of radio radiation of the sun in the meter wavelength range, was carried out on the Mars spacecraft.

There is considerable interest in joint work, providing for launch of small French technological satellites, by means of the power reserve of Soviet launch vehicles. The first satellite of this series, which was called MAS in the Soviet Union and SRET in France, was launched 4 April 1972, together with the Soviet Molniya-1 communications satellite. It investigated the operation of elements of new types of solar batteries, under the action of various factors of space on them (vacuum, increased radiation, sharp temperature changes, etc.). Launches of French technological satellites will be continued in the coming years.

The fundamental theoretical and practical work in the USSR and/52 France, based on observations of the movement of artificial earth satellites, has gained significantly, as a result of establishment of the new joint optical satellite observation stations in the Kerguelen Islands and in Guiana and the laser rangefinder observation station in Uzhgorod.

Izazhex is the name of an international program of special artificial satellite observations for geodetic purposes, organized on the initiative of French and Soviet scientists. The basic task of the experiments conducted in this program consisted of a detailed investigation of the gravitational field of the earth.[26]

To conduct research in the fields of space meteorology and aeronomy, about 40 Soviet meteorological rockets, with Soviet

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[26]See A. Masevich, "Joint experiments," Novoye vremya 2, 18-19 (1971).

and French scientific apparatus, intended for determination of temperature and other characteristics of the upper layers of the atmosphere, have been launched on Hayes Island (Franz-Joseph Land). Joint rocket experiments also have been conducted from Soviet research ships and at the French firing ranges in Guiana and Landakh.

Joint work in the field of space communications has provided high-quality exchange of television reporting between Moscow and Paris, through the Molniya communication satellite, during the state visits of the leaders of the two countries.[27]

A businesslike, creative situation has been put together in the relationships between the scientists and specialists of both countries. They can now meet together with the workers in the far north of our country, on the French Kerguelen Islands in the Indian Ocean and in South America, on the Guiana coast. French scientists are frequent guests of the Institute of Space Research, Academy of /53 Sciences, USSR, in Moscow, and Soviet scientists work in the scientific institutions of the National Center for Space Research of France.

As yet, there are no projects striking the imagination by their scale in active Soviet-French cooperation. However, the breadth and diversity of the connections and the gradual transition from comparatively simple joint experiments to solution of complicated scientific and technical problems, requiring great inventiveness and talent of scientists and engineers of both countries, are attracting attention.

New joint projects and experiments are being prepared at the present time, which will be implemented in the coming years. A new area, space biology and medicine, has been added to the fields of cooperation, provided for by the 1966 Agreement.

In the unanimous opinion of Soviet and French scientists and government figures, the cooperation between the two countries in the field of space research is proceeding very successfully, and it has already made a weighty contribution to the development of science in space and to the strengthening of friendly relations between the USSR and France.

Important successes in cooperation of the two countries in the field of space research have been noted in a Soviet-French declaration,

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[27] On experiments performed in accordance with the Soviet-French agreement, see also Yu. I. Gal'perin and L. A. Vedeshin, "Soviet-French cooperation in space research," Vestn. akad nauk SSSR 11, 84-92 (1972); P. Langereux, "Franco-Soviet cooperation is going well," Air et cosmos 452, 15 (1972); J. C. Husson, "Franco-Soviet cooperation for scientific study of space," Le Courrier du CNRS 10, 29-32 (1973).

adopted during the visit to France of the General Secretary, Central Committee, Communist Party of the Soviet Union, L. I. Brezhnev, as well as in the Soviet-French communique on the results of the meetings of L. I. Brezhnev and the President of France, G. Pompidou, in Zaslavl' in January 1973.[28] At this meeting in particular, both parties decided to study the possibilities of further development of Soviet-French cooperation in the field of space.

USSR-India

The first contacts between specialists of the USSR and India, on questions of cooperation in space research, were established at the beginning of 1960's, in connection with the decision of the Indian government to create an international firing range, at Tkhumba, in its territory, for rocket sounding of the atmosphere. The location of this firing range on the geomagnetic equator, located at equal distances from the magnetic poles of the earth, permits /54 interesting scientific experiments to be conducted, in study of the ionosphere and the magnetosphere of the earth.

Several countries participated in establishment of the firing range and the conduct of scientific research on it. On 13 January 1964, an agreement between the USSR Main Administration of the Hydrometeorological Service and the Department of Atomic Energy of India was signed, in accordance with which, the Soviet Union transferred to India free of charge a helicopter, computer, and several units for testing and checking instruments, to equip this firing range.

In furtherance of this agreement, a new agreement was signed in 1970, on organization of systematic rocket sounding of the atmosphere from the Tkhumba firing range, by means of Soviet meteorological rockets. This work is of not only scientific, but practical importance, for improvement of weather forecasts. Both Indian and Soviet specialists participate in the rocket launches and the joint experiments.

Although the first rocket was launched from the Tkhumba firing range as early as 1963, the inauguration of the firing range, with the Prime Minister of India, Indira Gandhi participating, was held after completion of construction, in February 1968. The firing range has now become an important international research and scientific center. In accordance with UN General Assembly resolution 2130 (XX), of 21 December 1965, the Tkhumba firing range came under the aegis of the UN.

The next important step on the way towards deepening and

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[29] See Pravda, 31 October 1971 and 13 January 1973.

developing Soviet-Indian cooperation in study of space was made on 10 May 1972, when an Agreement was signed in Moscow, between the Academy of Sciences USSR and the Indian Space Research Organization, on launching of an Indian satellite, using a Soviet launch vehicle.[29]

Launch of a scientific satellite, planned and fabricated in India, by means of a Soviet launch vehicle during 1974, in the territory of the USSR, is provided for by this Agreement. Solution of specific technical problems, connected with accomplishment of the project, is entrusted to a mixed working group, of specialists of both countries. The Soviet side is making available the launch /55 vehicle and launch facilities free of charge, and also is providing the necessary consultative and technical assistance, for execution of the joint project. The scientific results obtained by the launch of the Indian satellite will be available to scientists of the USSR and India and, according to understandings between them, will be presented to the world scientific community. During meetings, which are held periodically in the Soviet Union and India, specialists of the two countries have developed a specific chart of joint work, have discussed construction, scientific tasks and systems of the 250-kilogram satellite, as well as technical questions of mating the satellite to the Soviet launcher.

The building and launch of the first Indian satellite is serving as an important stimulus to the scientific and technical progress of India, which has taken a solid course towards development of a large national space research program and its application, and sees in this one of the means of rapidly overcoming economic backwardness. Soviet-Indian cooperation in study and mastery of space will undoubtedly be further developed, in accordance with the principles of the Treaty on Peace, Friendship and Cooperation between the Soviet Union and the Republic of India.

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The nations of socialist cooperation, as well as France, the U.S.A. and India is that group of states, with which the Soviet Union is performing the most important programs of joint exploration and use of space for peaceful purposes.

However, the scales and forms of international cooperation of the Soviet Union in mastery of space are considerably more extensive and diverse. They encompass a large number of states on various continents and belonging to various social systems.

Joint artificial earth satellite optical observation stations are located in the territories of 15 countries of Europe, Asia, Africa and Latin America. The laboratories of dozens of countries and hundreds of scientists are participating in analysis of lunar

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[29] See Appendix.

soil samples, returned to earth by Soviet unmanned spacecraft. An agreement has been concluded on cooperation with the European Space Research Organization, joining 10 western European governments. The USSR Academy of Sciences and Sweden have agreed on conduct of a joint space experiment by a Soviet artificial earth satellite in 1975. The Soviet Union is making an important and constructive contribution to the activities of many intergovernment and public organizations, occupied with problems of space research. /56

As the mastery of space indeed becomes an international affair, not only is the content of joint work being extended, but the geography of cooperation, the group of countries which are connected with this new sphere of human activity.

The policy of the Soviet Union with respect to international cooperation in the exploration and use of space was clearly and definitely defined at the very start of the space era. The first artificial satellite was launched within the framework of a program of international cooperation, the International Geophysical Year. In connection with the first flight of man in space, in an Address to the Central Committee, Communist Party of the Soviet Union, Presidium of the Supreme Soviet of the USSR and the Council of Ministers of the USSR in 1961, it was emphasized that "We considered victories in the mastery of space to be an achievement of not only our people, but of all mankind. We gladly place them in the service of all peoples, in the name of the progress, happiness and welfare of all peoples on the earth."[30] The effort of the Soviet Union to develop mutually advantageous cooperation of other countries in exploration and mastery of space was confirmed again from the podium of the XXIV Congress of the Communist Party of the Soviet Union.[31]

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[30] Pradva, 13 April 1961.

[31] See Materialy XXIV s'ezda KPSS [Materials of the XXIV Congress, Communist Party of the Soviet Union], Politizdat Press, Moscow, 1971, p. 30.

CHAPTER 3

EUROSPACE AND THE UNITED STATES OF AMERICA

1. Western Europe in the Search for Space Policy

During the time when space programs pursued only cognitive /57
goals, and the economic advantages of some types of space activity still were not obvious, relations between the U.S.A. and western Europe in this were developed relatively smoothly. However, these relationships then were built on a commercial basis, to a considerable extent: The U.S.A. NASA sold launch vehicles for the launching of European satellites.

With the appearance of satellites for applied purposes -- communications, meteorological, navigational, study of earth resources -- space stopped being the sphere of only fundamental scientific research, and it began gradually to be converted to the field of economic activity.

On account of the limitations of national economic and political interests, the countries of western Europe desire to have their international satellite systems of an applied nature, independently of the U.S.A. Thus, projects arose for European space communications systems, European meteorological systems (Meteosat) and aircraft traffic control communication systems (Aerosat).

An indispensable condition for creation of such systems is the availability of powerful launch vehicles, capable of injecting satellites into geostationary orbits. There are no such launch vehicles in western Europe, and, meanwhile, efforts to build them have ended in failure. The United States has used this situation as a means of exerting pressure on its western European partners and to maintain control over the launching of commercial satellites in the western world.

The proposal of the U.S.A. for its European alloys to partici-/58
pate in the long-term American space program, which is called "post-Apollo," has intensified the disorder and vacillation in western Europe on questions of space policy.

After the completion of the Apollo program, the creation of reusable space transport systems occupied the central position in the American space research program. First, it is proposed to build a "earth-orbit-earth" craft, for making trips between earth and geocentric orbits and, second, transport space tugs, for moving freight to higher orbits and for other purposes.

The decision to build an "earth-orbit-earth" transport spacecraft, designed for repeated use, was made by the President of the U.S.A. on 5 January 1972. Development and fabrication of two prototypes of this spacecraft, according to a statement of the NASA Director, J. Fletcher, requires six years and the expenditure of 5.5-6.5 billion dollars. It is proposed to use a modification of one of the existing rockets as the first stage of the craft. The winged, manned second stage, is being specially developed. Flight-structural testing of the transport craft is planned for 1978 and the first operational flight, for the end of 1979.

Inviting western Europe to participate in this long-term space program, and what is more, insisting on such participation (as is indicated by the increased activity of official representatives of NASA in 1969-1971), the United States of America pursued two main goals. The primary long-term goal was to deprive western Europe of the capabilities of creating its launch vehicles capable of injecting applied purpose satellites into orbit, competing with American ones. Relatively broad participation in the new American program would have required financial resources, exceeding the entire sum of present expenditures of western Europe on joint space projects. The second goal had a more specific and timely nature. Offering its "post-Apollo" program as international, NASA hoped to secure great support in Congress, to obtain large appropriations /59 for this program, supposedly in the name of "Atlantic solidarity" and fulfillment of their international responsibilities.

After the peak seen in 1966, the Congress of the U.S.A. steadily reduced the NASA budget and, at the threshold of the 1970's, it found itself with a budget half that of 1966, which led to a reduction in the workload and even the closing of some NASA scientific research centers. The NASA Director, J. Fletcher, has acknowledged that "critics of the program (NASA -- V. V.) have used this period of indeterminancy to propagate the impression that NASA has fulfilled its historic mission and can now be disbanded."[32] The English journal New Scientist wrote: "A little European money is assisting NASA to obtain the large amount of money it needs from the American taxpayers."[33]

Therefore, right in the first stage, when the program still had not been approved by either the President or Congress, NASA displayed particular activity in this matter, offering Europe the most advantageous and broad condition for participation in the new program at all stages of accomplishment of it, and, after the appropriation for the program was approved, gradually narrowed its proposal for participation of European countries in it.

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[32] Remarks by James Fletcher to the Salt Lake City Rotary Club, NASA News, 6 June 1972, p. 1.

[33] New Scientist 48/721, 16 (1970).

These conclusions are confirmed by the entire course of American-European conversations on participation in the "post-Apollo" program, which have gone on for a number of years and have been characterized by upward flights and drops in the moods of the European partners of the U.S.A.[34]

Western Europe was first officially invited to participate in the long-term American space program in October 1969, simultaneously with presentation of this program for consideration by the President of the U.S.A. This proposal was contained in a statement of the NASA Director, T. Payne. Following this, there was a series of meetings at various levels, between Europeans and Americans, during/60 which the proposal made was repeatedly confirmed and enlarged.

The U.S.A. declared that the cooperation of NASA with western Europe could be expressed in different forms: theoretical research, technological work and production of individual elements of the transport system in Europe. The possibility of placing foreign scientific equipment and foreign astronauts aboard the American orbital station also was promised.

The proposal of the Americans appeared tempting to the large aerospace companies of Europe, since they promised large orders and profits. Some of these companies, especially English ones, not waiting for the agreed decision of the western European countries, entered into direct contact with American companies and obtained preliminary orders from them, for planned individual systems of future transport craft.

On the initiative of Eurospace (an association of European aerospace companies), a meeting of 400 businessmen and political figures of western Europe and the U.S.A. was organized in Venice, in September 1970. Prospects of participation of Europe in the American space program were discussed at it. The principal conclusion arrived at by those assembled can be formulated in the following manner: Significant participation of Europe in American programs is an urgent necessity. For this purpose, the future joint European space organization should immediately establish appropriate relations with NASA.

For the sake of advertising American orbital station and reusable spacecraft projects, NASA and American industrial circles organized special conferences in Paris and in Bonn in the summer of 1970, in the course of which they appealed to the European countries to participate as extensively as possible at all levels and in all stages of accomplishment of the projects.

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[34]See A. Hocker, "The Discussions between Europe and the United States on Participation in the Post-Apollo Program," ESRO/ELDO Bulletin, 19, 4-7 (1972).

Under the influence of this advertising, the European space organizations spent about $10 million to develop a space tug and other elements of the "post-Apollo" program. In April 1970, a permanent west European bureau was established in Washington, for /61
communications with NASA and to obtain regular information.

Since participation in the American program swallowed up almost all the resources set aside by the west European countries for a giant space program, it was necessary to immediately determine the fate of the European launch vehicles, as well as the conditions for obtaining the American launch facilities, needed for launching European satellites.

In September 1970 and February 1971, the Chairman of the European Conference on Space, the Belgian Theo Le Fevre went twice to the U.S.A. to discuss political, financial and other conditions for European participation in the long-term space program of the U.S.A., as well as the question of the possibilities of obtaining American launch vehicles for launching European applied satellites. Following these visits, meetings of experts of both parties followed at the end of 1971 and beginning of 1972.

The Americans did not give clear answers to the questions asked by the European partners. Meanwhile, they conducted a complicated diplomatic game, for the purpose of delaying completion of the projects for building European applied space systems. Not giving solid guarantees as to sale of their launch vehicles for launching European commercial satellites, they simultaneously suggested that it was senseless to build independent European launch facilities; they would become obsolescent and turn out to be useless, with the appearance of the American reusable transport craft. Concerning participation of the Europeans in building such craft, despite their initial promises, the U.S.A. restricted the possibilities of it everywhere and, after the approval of the program for building a transport craft by President Nixon in January 1972, their position changed significantly, and only cooperation in developing one of the assemblies of the transport craft remained with Europe, limiting this participation with very rigid time schedules for approval of a final decision by the Europeans.

The multimillions expended by western Europe on development of the space tug and certain other elements of the transport system, /62
which initially were proposed directly for development by western Europe and permitted it extensive participation in building prospective rocket engines and electronic systems, proved thereby to be completely useless.

In connection with this position of the U.S.A., the English newspaper Financial Times wrote, on 9 July 1972: "Europe hoped for participation in creation of the space tug, within the framework of the post-Apollo program of building a transport spacecraft, but, as the Prime Minister (England -- V. V.) said in the House of Commons, the United States is establishing 'quite considerable limitations'

for the activities of Europe. They desire to limit us to "common technology" and to deprive us of participation in the fruits of advanced technology, which, possibly, is the result of this program."

In this manner, having secured the appropriation for its new program from the government and Congress of the U.S.A., NASA lost interest in European participation in this program. Representatives of NASA, in this case, did not conceal the fact that they had to consider unemployment in the American aerospace industry and, therefore, they preferred to keep the future possibility of creating a space tug in the U.S.A.[35]

"NASA obtained what it wanted," wrote the informative French journal Air et cosmos, "and what served as a basis for its proposal to the Europeans, credits for building its transport craft. Consequently, the time for generosity and politics of the "condescending older brother," offering its extensive aid to the "less developed" countries had passed."[36]

The circumstance that it had been decided to use the transport craft for military purposes, which the leaders of NASA stated openly,[37] did not play the lowest role in reducing European participation. /63

However, there was still another, a second, strategic purpose, to prolong the American monopoly in the western world on building and launching commercial satellites to the maximum. As has already been noted, the main means of putting pressure on the Europeans in this affair was bargaining over assignment of launch vehicles for launching such satellites.

After the hope for equal partnership in creation of the transport craft and, consequently, for its use for injecting satellites into orbit had evaporated, and, in this case, future sale of regular American rockets was not guaranteed, the question again arose

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[35] In order to secure a favorable decision from Congress on the new program, NASA considerably reduced the initial project, cutting the appropriation requested in half. Creation of the space tug was postponed to a later time in the revised project.

[36] Air et cosmos 442, 12 (1972).

[37] NASA Director, J. Fletcher, in a speech on 6 June 1972, said: "The spacecraft will have an important military application." See "Remarks by James Fletcher to the Salt Lake City Rotary Club," NASA News, 6 June 1972, p. 3. See also "U.S.A.: The "space shuttle' will be principally adapted to military missions," Air et cosmos 373, 21 (1971).

most acutely of creation of their own powerful launch vehicles in Europe. However, deep disagreements between the European partners, in connection with the American proposals, as well as technical failures in developing the Europa-2 rocket, for a long time did not permit the interested countries to come to any agreed decision.

The United States, in order not to finally alienate the western European countries or let them close ranks on this basis, to create their independent launch facilities, used the tactics of half-promise and reservation. If the Europeans attempted to combine their participation in the "post-Apollo" program with conditions for obtaining American launch vehicles, the U.S.A. persistently attempted separate consideration of these questions. Finally, on 9 October 1972, the day before the planned European Conference on Space, President Nixon made a declaration, which western European groups interested in participation in the long-term American program interpreted as a guarantee of delivery of launch vehicles to Europe, without any restrictions, and they used it as a basis for the need of stopping work on European launch vehicles.

Nixon declared: "The U.S.A. is prepared to supply launch /64
vehiclesto any countries and international organizations, for launching rockets for peaceful purposes, if this is compatible with effective international agreements."[38]

France regarded this statement with less enthusiasm, or more precisely, with disbelief. In this respect, the press wrote: "France is not convinced of the possibility of obtaining American launchers,and the new declaration of President Nixon, containing the same restrictions as before, changes nothing in this respect."[39]

Attention was turned to the fact that the reservation on compatibility with effective international agreements mainly concerns agreement on the Intelsat space communication system controlled by the Americans. Article XIV of this agreement imposes serious restrictions on the participation of members of Intelsat in other space communications systems, if they, in the opinion of the Intelsat assembly, may subject this organization to economic harm. On this premise, the USS.A. can refuse to sell rockets for launching European communications satellites.

In this manner, despite the widely advertised nature of the American declaration, the government of the U.S.A., as before, solidly championed the interests of the American space business, only softening its position outwardly a little. Simultaneously,

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[38] Air et cosmos 452, 16-17 (1972).

[39] Ibid.

the declaration of the President of the U.S.A. reflected the attempt of the United States to increase the sale of its rockets abroad, in those cases, when they would not be used for launching competing commercial satellites.

Eurospace again was faced with the same dilemma as in its formation, whether to have its own space program, including production of launch vehicles and scientific and applied satellites, or to restrict its role to that of an appendage of the American space program. The next section will cover the compromise solutions, worked out as a result of prolonged negotiations.

2. West European Space Programs /65

In the first half of the 1960's, the west European countries created three international space organizations: the European Space Research Organization (ESRO), the European Launcher Development Organization (ELDO) and the European Communications Satellite Conference (SETS). Besides this, the industrial companies of Europe interested in obtaining large orders, to be paid for by the governments, and not desiring to lag behind their American competitors, formed an association called Eurospace, as well as several industrial consortiums.

The official date of the birth of the European Space Research Organization is considered to be 20 March 1964, when its constitutive convention came into force. Negotiations for establishment of ESRO had lasted several years. Great Britain, France and the FRG played the most active role in the negotiations. The task which emerged here consisted of insuring the national research groups of the western European countries the capabilities of launching apparatus developed by them into space, as well as assisting in extensive cooperation between these countries in space research.

In compiling the scientific program of ESRO, even before its official establishment, the basic principles of its activity were determined: development and manufacture of scientific apparatus for satellites should, as a rule, be performed by the scientific institutions of the member-countries of the organization and be paid for from their national resources. Development and building of the satellites themselves, their tracking systems, as well as acquisition of the launchers, is accomplished by the organization and under its direct control.

Ten states were founding members of ESRO: Belgium, Great Britain, The Netherlands, Denmark, Spain, Italy, France, FRG, Switzerland, and Sweden. Austria, Ireland and Norway participate in its work as observers. Other countries can affiliate with ESRO, only with the agreement of all members of it.

ESRO has created an extensive network of scientific and technical institutions, located in different European countries. /66 The most important of them are Center for Space Science and Technology in the Netherlands, the Space Data Processing Center in FRG, the Institute of Space Research in Italy, the research rocket launching range in Sweden and a system of satellite tracking stations, consisting of four stations in Belgium, Alaska, Spitsbergen and the Falkland Islands.

The largest of these institutions, the European Center for Space Science and Technology, carries out planning, development, assembly and testing of satellites and instrument sections of research rockets, and also conducts cooperative research and development. Six hundred citizens of five European countries are colleagues of the Center.

The total number of workers in ESRO is over 1,000 persons, and only 200 of them work in the secretariat of the organization in Paris. For a number of years, ESRO has experienced difficulties in the selection of personnel with the necessary qualifications, which has been explained, both as a common shortage of such specialists in Europe and by a dislike of some of them to move to countries, in which the principal scientific and technical institutions of the organizations are located. The circumstance that the most highly qualified specialists are enticed to the U.S.A., also tells.

The highest authority of ESRO, responsible for accomplishment of its scientific, administrative and financial activities, is the Council, in which each member-state of the organization has one voice. The work of all the scientific and technical institutions of ESRO and of the Secretariat is directed by a director general, named by the Council.

By decision of the founders, the expenditures of ESRO in the first eight years of its existence (1964-1972) could not exceed $306 million. It was thought that this sum would permit launching 10-12 satellites and 300 research rockets. Actually, by the end of this period, ESRO had launched seven satellites and 171 rockets (125 of them successfully), considerably exceeding the established expenditure limit.[40] The sizes of the payment of the member countries were established, on the basis of national income, on condition /67 that not a one of the members of the organization had to require a payment exceeding 25 percent of the total sum of payments. About 70 percent of the payment fell to the share of Great Britain, France and FRG.

At the end of 1966, ESRO began to experience financial difficulties. It then became clear that the planned launches of the full

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[40] See "The White Ledger of the President of CSE on Eurospace," Air et cosmos 433, 15, 63 (1972).

number of research rockets and "small" satellites, at the times established and within the resources released within the eight-year period, could not be accomplished.

A number of countries, especially England, openly expressed dissatisfaction with the unequal distribution of industrial orders between the individual countries. Spain applied to leave the organization on 1 January 1968, "for economical, technical and financial reasons," and she reexamined this decision only after her payment was reduced by 90 percent. ESRO entered the second triennium of its existence (1967-1969), without a clearly outlined program or a specific budget. The situation became still more complicated, after postponements and the failure of the launch of the first ESRO satellite in 1967. As an "exceptional measure," for the purpose of preserving the organization, the 1967-1968 budget was adopted by the Council on a temporary basis, violating the rules established by the founding documents.

In November 1968, at a conference of ministers of the western European countries in Bonn, a compromise solution was successfully reached on a number of controversial questions, concerning the future of "Eurospace," including the question of the ESRO expenditure limit for 1969-1971, which was established at the sum of $172 million. Moreover, it was decided at this conference that, in the future, ESRO would cease to exist as an independent organization and become part of a single European space organization, which combines all presently existing space organizations in Europe.

From 1964 to 1968, when there was not a single satellite launched into orbit among the assets of ESRO, its main form of activity was launches of research rockets, which were conducted, both from the firing range of the organization in Sweden and from a number of national rocket ranges.

The first ESRO satellite (Iris), intended for study of solar /68 radiation and cosmic rays, was launched 17 May 1968, with a delay of a year from the time planned. The launch was accomplished from the Western Test Range in California, by means of an American Scout launch vehicle. The second satellite, Aurora, had the mission of study of geomagnetic phenomena in the ionosphere above the polar regions of the earth. It was supposed to be launched in December 1967. A holdup in production of certain scientific instruments and systems of the satellite led to a delay of almost a year in the launch. Both satellites were developed, with the direct participation and technical consultation of NASA. NASA launched them free of charge; however, in exchange, NASA obtained the unrestricted right of access to all the scientific information from these satellites.

ESRO launched five more satellites for scientific purposes in 1969-1972 (Heos-1, Boreas, Heos-2, TD-1A, ESRO-IV). These satellites were launched by means of American launchers, from the territory of

the U.S.A. The launches were carried out on a commercial basis. For each of them, the U.S.A. received several million dollars from western Europe (for example, for purchase of the launch vehicle and provision for the launch of the Heos-2 satellite, ESRO spent 6.6 million dollars). Discussion of various versions of one or more large scientific satellites, within the framework of a long-term program, has taken place, since the end of 1968. They had in mind here that their launches must be accomplished by means of the Europa-2 rocket, developed by western Europe. The ESRO Council selected, from among the projects proposed, a satellite for recording gamma radiation of galactic origin and a geostationary satellite for study of the magnetosphere.

The great importance, which applied satellites, primarily communications and meteorological, began to acquire, caused increased interest in them by ESRO, although, according to the constitutive convention, it could only deal with scientific satellites. At the request of the European Conference on CommunicationsSatellites, in 1967, ESRO developed a program for building a European communication satellite. A project also was discussed jointly with the U.S.A., for building a satellite, to provide air traffic control. In the /69 middle of 1971, France proposed further joint development of its meteorological satellite, Meteosat, to ESRO.

The future of European space programs and organizations, and the fate of the branched network of scientific and technical institutions and their numerous personnel is tied up into a single large bundle with the fate of "Eurospace" as a whole.

The secretariat of a second large regional space organization, the European Launcher Development Organization, was placed under the same roof with ESRO, on the outskirts of Paris.

In parallel with the creation of the European Space Research Organization and somewhat earlier, active diplomatic negotiations were carried on, with respect to the establishment of a European "rocket pool," for production of launch vehicles. As in the first case, England displayed the greatest activity in the negotiations, being interested in use of the English Blue Streak rocket, removed from production for military purposes in the spring of 1960, as the European rocket. This decision would permit the conservative government of England to make up tens of millions of pounds sterling spent on development of the Blue Streak to some extent and attract financial and scientific and technical resources of other countries for finishing up this rocket.

However, this decision did not suit the other two principal participants in the negotiations, France and FRG, who also wished to participate directly in production of European launch vehicles. Only after England made a concession, agreeing to participation of France and FRG in building the second and third stages of the rocket, was an understanding successfully reached on founding of a new organization. The other west European countries joined the

"pool," for reasons of prestige and the desire to insure some fraction of the rocket business for their industrial companies.

The convention on constituting ELDO became effective 29 February 1964. Seven countries were included in it: Belgium, Great Britain, The Netherlands, Italy, France, the FRG and Australia. Denmark and Switzerland participated in its work as observers.

The organization was directed by a Council, in which each /70
state had one voice. The Council established financial and scientific-technical committees. The international secretariat of ELDO, numbering about 300 workers, was headed by a secretary-general.

The basic mission of ELDO is to provide western Europe with its own facilities for launching satellites for scientific and commercial purposes. It was assumed that one of the principal users of rockets produced by ELDO would be the European Space Research Organization.

The initial program of ELDO, accomplishment of which was planned for the end of 1966, contemplated building a three-stage launch vehicle, capable of injecting a satellite into a low, circular orbit, with a weight of up to one ton, and development of an artificial earth satellite, usable for flight-design testing of launch vehicles.

The responsibilities for accomplishing this program was distributed among the members of the organization in the following manner. England supplied its Blue Streak rocket, which was used as the first stage of the European rocket. France was occupied with development of the second stage, Corali, and FRG, the third stage, Astris. Italy was charged with building an experimental artificial earth satellite, The Netherlands, telemetry systems, Belgium, the ground control station. Australia was drawn into the work of the organization, for the purpose of using its Woomera rocket range, for testing and launching the launch vehicle.

A limit, in the amount of $210 million, was established for accomplishing the initial program; in this case, about 40 percent of the costs were paid by England and approximately 20 percent each, by France and FRG.

From the very start, work to create a European launch vehicle took place in disagreement, the established schedules were disrupted, and arguments, with respect to the fraction of the expenses of the ELDO member-countries, did not stop. Every two years, in 1966, 1968 and 1970, the organization survived an acute financial crisis. All the work of the organization was suspended repeatedly for several months. Only extreme measures and the resolute intentions of France and the FRG to preserve the European program for creation of a launch vehicle at any cost saved ELDO from complete bankruptcy.

Soon after the start of work on the Europa-1 rocket, it was /71
revealed that at least twice the resources initially thought would

be required for its completion. A conference of the ministers of the ELDO participating countries, meeting in 1966, decided to reexamine the initial program of the organization. Beside completion of work on building Europa-1, it was decided to constitute a so-called supplementary program, for production of an improved launch vehicle, Europa-2, capable of injecting a satellite weighing up to 200 kg into geostationary orbit. It was intended that the launch of Europa-2, from the new firing range in French Guiana, would allow use of this launch vehicle for European communications satellites, to insure sale of the ELDO rockets.

To accomplish the initial and supplementary programs, the conference of ministers established a limit, in the amount of $626 million. The portion of England in these expenses was considerably reduced, owing to an increase in the payments by France and FRG.

A year after making these decisions, it was revealed that completion of both programs by the end of 1971 would require another $100 million. A new financial crisis broke out, which was activated by the application of England in April 1968 to leave the organization immediately.

The special interest of France and the FRG in preservation of ELDO was explained, besides political considerations, by the desire to provide a European launch vehicle for the Symphony communication satellite, which is being developed by these two countries. The U.S.A., considering Symphony as a competitor of the Intelsat commerical communication satellite system, refused to guarantee launch of this satellite with its launch vehicles. Besides, France was interested in use of its range in Guiana for launching European rockets; she had expended considerable resources in building it. On the other hand, England lost interest in the European programs, not seeing a direct advantage here and becoming more and more oriented towards direct participation of its aerospace industry in the American space program. Only under strong pressure from the partners, who connected the question of membership of England in ELDO with its reception in the Common Market, England agreed to continue financial participation in the work of the /72 organization, until 1971.

Meanwhile, ELDO more and more lost the confidence of the other members of this organization. Italy, losing a number of orders, also declared termination of support of the ELDO program after 1971. Hard times set in for ELDO in the fall of 1970, when a deep crisis shook all of Eurospace. However, the fate of the European space organizations, like the space program of Europe overall, had already been decided at another level, within the framework of a permanent conference on space, of the ministers of the western European countries.

Concerning work on the Europa-1 and Europa-2 rockets, the first of these launch vehicles did not succeed in injecting a single satellite into orbit, despite the successful conduct of a number of flight-design tests.

Tests of the Europa-2 rocket, intended for launching a Symphony communications satellite, built by France and FRG, as well as two ESRO scientific satellites in 1974-1975, repeatedly ended in failure. After the usual failure, during a test launch at the Kourou range (Guiana) in November 1972, when $640 million dollars had already been spent in building this rocket, confidence in it finally died, and the members of ELDO, only with great difficulty, agreed to approve new "temporary monthly appropriations" to continue the work.

Simultaneously, ELDO began to develop a more powerful Europa-3 launch vehicle, capable of injecting satellites weighing 750 kg into geostationary orbit, by the end of the 1970's. This rocket project, building of which was undertaken by FRG, France, Belgium and The Netherlands, took shape in April 1970. Expenses for development of Europa-3 were estimated at $470 million. It was considered that this project would be profitable, since, according to the calculations of German and French specialists, Europe may require 40-50 launch vehicles from 1980 to 1990 and 60-70 launch vehicles from 1990 to 2000, for launching satellites, mainly for applied purposes.

Two years after this, the FRG abruptly changed its attitude toward building Europa-3, and began to orient western Europe towards use of American rockets.

A fatal blow was struck on ELDO on 27 April 1973, when, at a /73 meeting of the ELDO Council, the representatives of France and FRG announced the decisions of their governments to stop financing programs for building the Europa-2 rocket. This decision was equivalent to the disbanding of ELDO.

A third organ of the western European countries in the field of mastery of space, the European Conference on Communications Satellites, was not an organization, in the strict sense of the word, although it frequently was so called. It did not have a permanent budget, scientific-research institutions, and it was not occupied with direct creation of rocket-space technology resources and satellites.

The conference was first called in May 1963, to work out a coordinated position of the west European countries, with respect to the American offer to create a world-wide satellite communications system. Since then, coordination and agreement on points of view on questions of use of satellites for commercial communications purposes has become its main task.

Sixteen governments have participated in the work of the conference, the sessions of which have been called periodically in various countries. Auxiliary organs of the conference were a committee on organization questions, a committee on space technology, a technical planning group and a secretariat. The activities of the SETS have been carried out in close contact with other European

space organizations, as well as with the European Union of Radio Broadcasting and Eurovision.

On the eve of, and during negotiations to work out the so-called final agreement on the Intelsat international communications satellite consortium, which began in Washington, in 1969, the governments of the western European countries used SETS, for working out a unified European position. In its way, this was an effort to undertake collective action, for protection of the political and economic interests of the countries of western Europe, in the face of the American dictates in the field of space communication.

The second goal, set by the European conference on Communication Satellites, consisted of development of a European program for creation of a regional communication system, by means of artificial earth satellites. Direct development of the European communication satellite project, by request of SETS, was undertaken by the /74
European Space Research Organization. Initially, the matter concerned creation of a television satellite, which would respond to the needs of Eurovision, and which could be launched by one of the launch vehicles developed by ELDO. After it was revealed that creation of a satellite, only for transmission of television programs, was economically inadvisable, this project was rejected.

Subsequent discussion of questions of creating European applied satellites was transferred to the level of the ministers of the western European countries, who, at their meeting in Brussels, as the European Conference on Space, in 1970, decided to concentrate their efforts on creation of an operational space communication system by 1978-1980. This system must provide for both requirements for telephone communication channels and for transmission of television programs and other types of information. The cost of development of satellites for the European communication systems was estimated at $450 million.

In July 1970, the European Conference on Space adopted a resolution to terminate the activities of SETS. It was no longer necessary, since negotiations to work out an agreement on Intelsat were approaching the end, and creation of European communication satellites was entrusted to ESRO.

Before 1966, the work of the European space organizations was practically uncoordinated, and no unified policy in the field of exploration and mastery of space existed. Difficulties in bringing planned programs into being, disagreements between the western European countries on placement of the orders in industry, and a considerable excess over previously established estimates of expenses all required regulation and coordination of the activities of the existing space organizations.

On the initiative of the Italian government, the question of coordination of European policy in the field of space was included

in the agenda, for a conference of ministers of the ELDO member-countries in 1966. This initially proposed creation of a new permanent international body, the European Conference on Space.

Seven member-countries of ELDO, as well as Denmark, Spain and a number of other countries as observers, participated in the /75
first European Conference on Space, in December 1966. The conference decided to carry out an analysis and evaluation of existing national and international space programs, as the first step on the way to working out a unified European policy in this field.

The second conference took place in Rome, in the summer of 1967. Practically all the states included in the three European space organizations participated in its work. A resolution was adopted in Rome, in which the European Conference on Space was proclaimed a permanent body, conducting its meetings annually at the ministerial level, for the purpose of working up a coordinated European policy on space and monitoring its execution. The specially constituted consultative committee on programs was charged with presenting proposals on formulation of such a policy.

The report of this committee contained the following conclusions: Extensive development of coordination of European space programs is necessary; programs in study of space, including launches of large satellites, should be actively continued; Europe should immediately proceed to creation of satellites for practical purposes, beginning with communication satellites; the Europa-1 and Europa-2 launch vehicles should be used in launching satellites, when this is possible; a single European organization on space should be constituted.

Motivated by its conclusions on the necessity for a broad program of space research for Europe, the committee referred first and foremost to considerations of a political nature: "First and foremost, Europe must demonstrate its determination to be independent."

Compromise solutions, concerning the current activities of European space organizations and further prospects, were adopted at the third European Conference on Space, which took place in FRG in November 1968. A decision was approved to fuse the three existing space organizations into a single European organization. A plan for a convention to create this organization was commissioned, to be ready by 1 October 1969. The conference approved the ESRO budget for 1969-1971, and it authorized the ESRO Council to assume the responsibilities for individual projects, execution of which was planned for the period after 1971. Creation of a European communications satellite was planned, as a prospective mission, for the purpose of direct transmission of television programs to /76
individual receivers, as well as development of large scientific research satellites, the building of which goes beyond the limits of the economic and technical capabilities of the individual countries.

In connection with the fact that different points of view developed among the western European countries, with respect to the advisability of further development of European launch vehicles, it was proposed to give future programs a more flexible nature, permitting the countries, in case they so desired, not to participate in all projects, but only in certain of them.

Putting the decisions adopted at the conference in FRG into practice immediately ran into difficulties, since England and Italy refused to participate in additional expenditures, connected with execution of the ELDO program, approved by the conference of ministers. The European Launch Vehicle Organization again came down with a fever and, at the same time, the entire system of decisions on the future European space program. A new element was introduced into this tense enough situation by the proposal of the U.S.A. that the western European countries participate in prospective work of NASA, in building orbital stations and transport spacecraft.

Under these conditions, the fourth European Conference on Space met in Brussels, in July 1970. At the same time, Italy was in a government crisis and a new, conservative government had recently come to power in England. By virtue of these circumstances, it was clear that decisions of the conference might be only of a temporary nature. The questions, which the ministers of the western European countries were faced with discussing, concerned long-term prospects: a European space program up to 1980, fusion of the existing space organizations and the participation of Europe in the future space program of the U.S.A.

A majority vote of the conference approved a resolution to create a European communication satellite system by 1978-1980, on the basis of a geostationary communication satellite developed in Europe, weighing 700 kg, with 7200 telephone and three television channels. It also was decided to continue work, jointly with NASA, to create the Aerosat system and to begin research on European meteorological satellites. /77 The conference acknowledged the advisability of opening for signature at the beginning of 1971, a convention to constitute a single European space organization.

At the Brussels conference, a definite split was noted between England and the small countries on the one hand, and France, FRG and Belgium on the other. A situation took shape, in which the basic time for accomplishment of the program for construction of European launch vehicles was undertaken by the last three countries, who, in addition, were not confident that Europe would use these launchers.

The heated atmosphere, which became incandescent at the first session of the Brussels conference, led to an explosion which occurred during the second session in November 1970, also in Brussels. The conference could not adopt an agreed solution to any of the questions discussed (applied and scientific research satellites, launch vehicles, a single European space organization).

The culmination of these events was the declaration of France, FRG and Belgium that, since only these countries take a consistent position on the questions of the European space program, they had decided to go ahead in their own way, if it was required, outside the framework of existing European space organizations, and they invited other countries to join with them. The heart of the program supported by the three countries consisted of the Europa-3 launch vehicle and the communications satellite.

The existence of Eurospace in the form it took in the past decade, was questioned.

Since the decision on fusing the existing organizations into a single European space organization was hanging in the air, the authorities of ESRO and ELDO had to make temporary decisions in the succeeding years, on programs and financing of these organizations, so as not to permit their complete breakdown.

A number of important decisions on the ESRO program were made by the Council of this organization in December 1971.[41] The principal decision concerned the program of building of applied satellites, /78 Aerosat, Meteosat and the European communication satellites, in particular. It was decided to appropriate about $300 million in 1972-1974 for these programs, accomplishment of which were undertaken by ESRO. The organization was given the right to plan expenditure of resources for such satellites in succeeding years, right up to 1980.

The ESRO Council also decided to continue work on building European scientific satellites, considerably cutting the appropriations for these purposes, however. Simultaneously, for the sake of savings in resources, it was decided to liquidate the ESRO firing range in Kirun, transferring it to Sweden, and the Institute of Space Research in Italy.

Expansion of the applied sphere of ESRO activity required reexamination of its constitutive convention, which provided for creation of only scientific research satellites and sounding rockets. Corrections to the convention, prepared by a specially created working group, makes it possible for ESRO members to participate in projects of interest to them, for development of applied satellite systems. For this purpose, each of the interested members of ESRO will include special protocols, defining the conditions of their accomplishment and financing, in each such project or program.

The new spell of crisis, beginning with the 1970 Brussels conference, proved to be the most protracted and threatening to the

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[41] See H. Kaltenecker, The Reform of the European Space Research Organization: Its New Legal Concept. Mimeo, 1972, p. 6.

existence of the very foundation of Eurospace. For a period of two years, the next session of the European Conference on Space could not be convened.

Addressing the International Astronautical Congress in Vienna in October 1972, the ELDO adviser on legal questions, M. Bourély, stated: ". . . the present position is characterized by total uncertainty concerning not only the date of the next meeting of the ministries of the European countries concerned with space affairs, but in the very possibility of organization of such a meeting, and, which is still worse, of the results which could be expected of it."[42]

The situation became still more complicated, as a result of the divergence in the positions of France and FRG, having previously displayed the greatest consistency on the question of building /79
European launch vehicles. These headlines of articles appearing in the French press were characteristic of the attitude prevailing in western Europe at the time: "A difficult summer for the European Conference on Space," "Eurospace -- will it survive?"

At an unofficial meeting of the administers of certain western European countries, which took place in November 1972, having as its purpose the bringing together of points of view, in preparation for the session of the European Conference on Space, France turned out to be the only country, which categorically insisted on development of the western European Europa-3 launch vehicle. The FRG, agreeing to make some financial contribution to building this vehicle, stated that it does not consider its building to be an urgent necessity and that it intends to associate with the prospective American space program.

In this connection, the Minister of National Defense of France, Michel Debré, stated, in an interview with the newspaper Figaro, that France would be forced to carry out the space program independently, since the joint space program of the western European countries had reached an impasse. "Our partners wish to be satisfied with the role of subcontractors to the Americans," said Debré.[43]

A month after this statement, in December 1972, the session of the European Conference on Space met in Brussels. As a result of complicated diplomatic maneuvers, the ministers of the western European countries succeeded in reaching a new compromise.

Together with an agreement in principle to participate in the American reusable transport spacecraft program, for which the FRG and England particularly fought, it was decided to support the French plan of building European launch vehicles. This time, the

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[42] M. Bourély, La crise spatiale européen [The European Space Crisis], Mimeo, Vienna, 1972, p. 1.

[43] Figaro, 15 November 1972.

question was not of the Europa-3 rocket, work on which it had been decided to stop, but of a rocket, which the press called Europa-2-1/2, a vehicle of less power and less cost, which, nevertheless, will provide for placing European applied satellites into geostationary orbit by 1980. France expressed readiness to shoulder 60 percent of the cost of building this vehicle, on condition that it is built by the industrial consortium controlled by it. Simultaneously, it was again decided to combine ELDO and ESRO into a single organization on 1 January 1974.

The next session of the European Conference on Space met in Brussels in July 1973. It was decided there that a single organization of western European countries, for research and use of space, receiving the name of European Space Agency, should begin to function on 1 April 1974. On the initiative of FRG, which accepted 52 percent of the expenses, it was decided to participate in building a flight unit for the American transport craft. The program to build launch vehicles, the main portion of the expenses of which falls on France, as well as the program to build the maritime navigation satellite, in development of which England displayed particular interest, were approved.

In accordance with these decisions, the countries of western Europe and the U.S.A. signed a series of agreements in August-September 1973, by which ESRO undertook development and production of the flight unit of Spacelab for the American reusable transport spacecraft. The expenses of western Europe in fulfilling this project were estimated at $300-400 million.

3. NASA International Programs

The U.S.A. National Aeronautics and Space Administration has established contacts and is carrying out cooperation in one form or another with many countries. For these purposes, a significant number of special agreements has been concluded, some at the government level and others directly between NASA and the corresponding departments and organizations of foreign countries. According to official American statistics, there are about 250 such agreements.

Many of them are connected with the establishment of stations on foreign territory, to receive information from American spacecraft and satellites and to control their flight. A number of agreements provide for joint operation, in the literal sense of this word. /81 They are mainly in 2 areas: launching foreign artificial earth satellites or scientific apparatus of other lands in American satellites by American launchers and conducting joint experiments, using research rockets (meteorological and geophysical).

The third area of joint work (in the field of communications, meteorology and study of natural resources) was aimed at enlisting foreign countries in the building of satellite systems for applied and commercial purposes. Thus, the initial experiments of NASA with communication satellites paved the way of the Intelsat consortium.

Work with meteorological satellites provided a foreign market for American stations for receiving information from these satellites. Recently, NASA has been involving foreign countries in a program of use of satellites for study of the natural resources of the earth.

Not counting the satellites of the European Space Research Organization already mentioned, the U.S.A. has launched English, Italian, French, FRG and Canadian satellites. The satellites were intended for conduct of ionospheric research, study of low-frequency radio radiation and measurement of the electron concentrations, determination of the density of the upper atmosphere, measurement of the energy spectra of primary cosmic rays and for other scientific tasks.

NASA has placed a portion of the foreign satellites into orbit free of charge, considering them to be joint scientific experiments. In other cases (the majority of the ESRO satellites and Intelsat), the launches were accomplished on a commercial basis; in this case, NASA required payment of the costs of the launch vehicle, as well as compensation of the launch expenses. It is emphasized in official documents that launches of foreign satellites, on condition of payment of the cost of these launches, is a NASA international activity of "growing importance."[44]

Proposals of foreign scientists for installation of their instruments aboard NASA satellites go through a preliminary evaluation and selection procedure, together with proposals of scientists of the U.S.A. In case they are adopted, each of the contracting /82
parties bears the expenses of performance of its portion of joint operations. A number of instruments developed and produced in the countries of western Europe have been installed in American geophysical and solar satellites, as well as on satellites of the Explorer series and in Skylab.

Joint launches of meteorological and geophysical rockets have been carried out, both from the territory of the U.S.A. and from the territories of the cooperating countries. In some cases, the conditions for conducting experiments with research rockets contemplate sale of such rockets to other countries. Agreements on launching rockets in Brazil, India, Norway and certain other countries have permitted the U.S.A. to conduct a series of geophysical and meteorological experiments in various geographical regions of the globe. According to information, NASA performed experiments involving launch of research rockets from 19 countries in 1973.

The facts presented show that NASA is performing active and diverse international activities, but the advertising of this activity is being carried out no less actively and extensively. A

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[44] NASA International Programs, May 1973, Mimeo, p. 3.

number of officials of the U.S.A. are emerging in the role of propagandists for the NASA international programs. It is continually emphasized here that encouragement of "cooperation with other countries and groups of countries" was contemplated by the 1958 law, in conformance with which NASA was established.

Political figures of the U.S.A. do not hide the fact that the National Aeronautics and Space Administration was formed "as a direct result" of the shock, which enveloped the U.S.A. after the launch of the first artificial earth satellite in the Soviet Union.[45]

The main task facing NASA consisted of attaining "national leadership in space." For the sake of this goal, NASA was provided with tremendous resources and great authority. The annual budget of this organization grew from $300 million in 1959, in the course of development of the most expensive Apollo program, to $6 billion in 1966. /83 In the period of growth of its activity in the middle 60's, NASA combined 17 major scientific research centers with a staff of 33,000 workers. About 20,000 industrial companies filled the orders of NASA. The total numbers of workers, engineers and technicians occupied in the U.S.A. space industry reached 400,000 persons.

The largest aerospace corporations derived the greatest profits during this artificially heated boom: North American-Rockwell, Boeing, Lockheed Aircraft, McDonnell-Douglas and others. Emerging in the role of the main contractors of NASA, they insured themselves billion-dollar orders, guaranteed by the government and returning high profits. It was natural that these corporations considered questions of international cooperation primarily from the point of view of possibilities of deriving new profits, through expansion of sale of their products or of obtaining new government orders.

Standing guard over the interests of its aerospace industry, the U.S.A. is attempting to guarantee it commodity markets in other countries, to make the space programs of these countries dependent on the U.S.A. and not to permit competition of foreign countries in the field of practical use of space.

The commercial gain and economic interest is one of the main factors of American international cooperation programs in mastery of space.

Speaking to one of the committees of the Senate of the U.S.A. in March 1970, the former NASA Director, T. Payne, presented certain interesting numbers and facts. The expenditures of NASA on

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[45] See, for example, the statement of Congressman Hetschler, Hearing before the Subcommittee on Manned Space Flight of the Committee on Science and Astronautics, U.S. House of Representatives, 31 May 1972, p. 24.

international programs in the past decade amounted to about $40 million. At the same time, the contributions of other countries in performing these programs is estimated at $200 million.[46] "Satellites, which other countries furnish us for launching by our launch vehicles," stated T. Payne, "are considerably more expen- /84
sive than the launch vehicles we use for launching them into orbit . . . . Wherever we can, we encourage other countries to undertake the most complicated problems, in particular, such as the German solar probe . . . . International cooperation is a good way to assist in expanding our contracting budget, for the purpose of obtaining the best results for our country and countries cooperating with us." We note that the cost of the Helios project (the solar probe mentioned by T. Payne) is estimated at $150 million, of which 80 percent will be paid by FRG.

On the question of what effect international cooperation in space is showing on the U.S.A. aerospace industry, asked of him by one of the Senators, Payne responded that he considers this effect to be very favorable. Payne presented data, to the effect that foreign purchases from U.S.A. industrial companies, in connection with international projects, is providing the United States with a currency inflow of from $10 to 20 million annually. Practically all the foreign satellites launched into space by NASA were built with the assistance of American companies. Only on the basis of the 1960 agreement on conduct of joint tests of communication satellites, France purchased equipment from American industry, in the amount of over $10 million. All this gave a full basis to the director of the American space department to declare that international projects are returning "very real advantages to the United States."

Approximately half the resources expended by other countries in accomplishing projects jointly with the Americans enter the U.S.A. in the form of compensation for equipment purchased and payment of the cost of the launch vehicles and their launching. NASA international activities thereby facilitate a considerable inflow of gold to the U.S.A. and marketing of American aerospace industry production in foreign countries. Moreover, since practically all joint projects are entered one way or another in the national space research program of the U.S.A., participation of foreign governments in them means essentially partial financing of the American national program.

The U.S.A. and Japan signed an agreement in the summer of /85
1969, on cooperation in the field of space. In conformance with this agreement, American industry received the right to export nonsecret

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[46]According to estimates presented in the American journal Astronautics and Aeronautics, total expenditures on NASA international programs up to 1972 amounted to $500 million; 75 percent of them were paid by foreign partners of NASA (Astronautics and Aeronautics 10/9, 7 (1972).

equipment and technological information, necessary for production of launch vehicles and satellites, to Japan. In this connection, the statement of State Department representative Nesbitt, that the U.S.A. is prepared to export its space equipment and technology extensively to other countries, is not without interest. As we have already noted, for several years after this, the President of the U.S.A. spoke out with the offer to sell American launch vehicles to all countries, in those cases, when they are not used for launching satellites competing with the American ones.

The American-Japanese agreement contained a requirement that communication satellites, which might be built or launched by the Japanese, using American technology, not compete with present or future activities of Intelsat. The commercial aspect in the American-Japanese relationships on space, just like the U.S.A. international space policy as a whole, also is revealed in plans to sell Japan meteorological satellites and in the control of competition in connection with this, between three American companies, laying claim to obtaining the corresponding orders.[47]

The attempt of the U.S.A. not to permit independent development of national space programs in the capitalist countries was dictated by the desire to guarantee stable commodity markets for its aerospace industry and remove possible competitors in the way. The U.S.A. sees an important way for achieving this goal in the NASA international programs. As early as 1964, one of the American journals wrote that "The NASA international cooperation programs have assisted in orienting many other national space programs toward American industry."[48]

The U.S.A. also confers great importance on the political aspect of international cooperation in space research. Broadly advertising the NASA international programs, American propaganda is attempting to represent the U.S.A. as a country, which willingly /86 divides its scientific and technological achievements with other countries, suppressing the economic and scientific-technical advantages derived from such cooperation by the United States, in this case.

The United States considers cooperation in space as one of the major means of attracting the scientific and technical intelligensia of other countries to its side. In this respect, the developing countries are allotted an important place in the NASA international programs. In September 1969, NASA concluded an agreement with the Department of Atomic Energy of India, concerning organization of direct television transmission of an educational nature, servicing

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[47]See Flight International 3296, 741, (1972).

[48]Aviation Week and Space Technology 81/1, 68 (1964).

five thousand of the most remote Indian villages, in 1974, by means of an American satellite. India is contributing $15 million for accomplishment of this project.

In this connection, the director of NASA international programs, A. Fratkin, has written: "Other developing countries and representatives of the west, which hope that technology may prove to be useful for attacking great social problems of the developing world, will attentively follow the American-Indian experiment, in the field of educational television transmission, by means of an artificial earth satellite."[49]

Negotiations for carrying out similar programs in the field of space communications also have been carried on with a number of South American countries. Actively advocated plans for involving the developing countries in the American program of use of artificial satellites for study of the natural resources of the earth are pursuing these same goals.

Beside the economic and political motives which govern the U.S.A. in carrying out its international space program, scientific and technical considerations are of great value.

One of the main reasons, for which NASA was authorized to conclude agreements with foreign countries, was the necessity for establishment of a network of stations scattered all over the world, for tracking and receiving data from spacecraft and satellites. Many NASA international agreements have been concluded for precisely this purpose. In 1973, NASA had 20 stations on the territories of other /87 countries. NASA divides these stations into three main groups: stations for safety of manned flights; stations serving scientific satellites; and optical observation stations. Besides this, deep space communication stations have been established in Australia, Spain and the U.A.R. In some cases, the support or maintenance expenses of these stations and their personnel are completely or partially paid for by the country, in the territory of which they are located. NASA also maintains close working contacts with the satellite tracking station systems built by the European Space Research Organization and France.

Experimental work with communications satellites, which was carried out initially by NASA, and meteorological and geodetic research also required location of ground equipment in foreign territories.

The interest of NASA in conducting joint work is manifested in the fact that, in a number of cases, foreign countries assume expenses, connected with performing important and costly scientific research, provided for in the American national program. The results

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[49] Science 169, 334 (24 July 1970).

of such research immediately become the property of NASA. Thus, the NASA ionospheric research program is being performed, with the aid of Canadian satellites; as has already been stated, FRG has undertaken accomplishment of the complex project to build a solar probe, etc. Many of the scientific discoveries and technological innovations produced in foreign countries, as a result of NASA cooperative programs, are transferred to the hands of the Americans.

NASA international activity permits the U.S.A. to attract the best foreign scientists, for execution of its missions. The widely furnished training and retraining of foreign specialists in the fields of space science and technology, which are being carried out by NASA, together with the U.S.A. National Academy of Science, serves these same purposes. The education of foreign specialists is being conducted in the U.S.A. far from unselfishly. The conditions are such that those being educated must remain in American laboratories long enough to be of practical advantage to these laboratories. Many of the foreign specialists completing training in the U.S.A., then /88 remain for good, to work in industry and scientific research centers of the U.S.A.

At the same time, it must be noted that the scientific and technical interest in international cooperation in performance of space research assists the development of cooperation between countries with different social structures. It is precisely this interest, together with the overall improvement of the state of Soviet-American relationships, which permitted conclusion of an agreement between the USSR and the U.S.A. in May 1972, on cooperation in exploration and use of space for peaceful purposes, which was discussed in the preceding chapter.

Analysis of the American international cooperation programs shows that objective prerequisites for extensive scientific and technical cooperation in the mastery of space frequently is used by the United States, to extract unilateral economic, political and scientific-technical profits and advantages. One of the most recent examples of this is the American-European negotiations on creation of the Aerosat space system, which is intended for air traffic control, improving flights across the Atlantic and Pacific Oceans.

Negotiations went on for a period of two and a half years, between ESRO on the one hand, and NASA, the Federal Aviation Administration and the State Department of the U.S.A., on the other, establishing the American-European experimental Aerosat system, on an equal basis. To guarantee its participation in this program, the member-countries of ESRO decided to incorporate the necessary changes in the ESRO constitutive convention, and they appropriated large cash resources.

However, when the text of the agreement between ESRO and the U.S.A. was completely prepared, and the date for signing it had been determined, the White House, under pressure from American corporations,

dissatisfied with the conditions of this agreement, imposed a veto on signing it in February 1972 and abrogated the preliminary understanding. The government of the U.S.A. notified its partners that "After a study, carried out with internal, parliamentary and international aspects of this matter taken into consideration, the President decided that the plan for agreement between ESRO and the /89
FAA (Federal Aviation Agency, U.S.A. -- V. V.), on the aeronautical satellite program, is not in conformance with the policy of the government of the U.S.A., and it must be radically reexamined."[50]

The essence of the problem was that the American corporations, laying claim to a predominant position in development of such a commercial system, did not desire that, even at the experimental stage, the owners of the system not be private companies, but government organizations, and they also did not wish to divide the contracts equally with the western European partners.

In connection with this refusal of the U.S.A. to follow the agreement reached, the English Daily Express wrote that "The American owners have grasped the capability of attracting large profits and have exerted increased pressure on the White House, after which all the good will of Washington evaporated quickly and without a trace."[51] ESRO announced its decision to begin test-design work, connected with development of the Aerosat system, independently.

The dialogue between the U.S.A. and western Europe on the Aerosat system was renewed in the fall of 1972. However, new disagreements arose in it immediately, concerning the range of frequencies and other technical characteristics of a two-satellite system, to service the Atlantic Ocean zone. It was proposed initially that Aerosat would service the zones of the Atlantic and Pacific Oceans. Strong pressure was exerted on the Europeans simultaneously, for them to retreat from the principle of equal partnership, and they reduced the proportion of their participation in developing this system, in favor of American industry.

After the House of Representatives of the U.S.A. Congress, taking the objection of the aircraft companies into consideration, refused to approve the Federal Aviation Agency appropriation for work connected with development of the Aerosat system, the negotiations again came to a dead end.

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[50] Air et cosmos 425, 15 (1972).

[51] See Daily Express, 9 March 1972.

CHAPTER 4

SPACE AND INTERNATIONAL ORGANIZATIONS

The international "space" organizations existing at the present time can be arbitrarily divided into two groups; organizations created for direct accomplishment of international scientific or applied space programs, and organizations, the purposes of which are assistance in development of space research and joint discussion of results obtained, as well as study of the political-legal aspects of the mastery of space.

The European space organization, as well as the international organizations of communications through the Intersputnik and Intelsat artificial earth satellites, belong to the first of these groups. As a rule, they are founded by States having large financial resources, and they have their own scientific-technical base.

The second group of organizations (this chapter is devoted just to it), not conducting independent work using space technology resources, nevertheless plays an exceptionally important role in the development of international cooperation in space research, on the broadest international base. Among these organizations, we find both intergovernment -- the UN Committee on Use of Space for Peaceful Purposes and specialized UN institutions -- and public scientific organizations -- COSPAR and the International Federation of Astronautics.

A large number of international organizations is now occupied with questions of study and use of space, in one aspect or another. Only one of them would take much space and time. However, there is the paramount interest in both of them, which are called "space," since problems of exploration and use of space constitutes the main /91 content and significance of their existence and activity.

1. UN Committee on Use of Space for Peaceful Purposes

The UN Committee on Use of Space for Peaceful Purposes occupies a special place among the international space organizations. This is the only special intergovernment body, in which the representatives of different countries and different social systems discuss questions of cooperation in mastery of space. Thirty-seven countries are represented on the Committee, among which are the Soviet Union, the United States of America and a number of other socialist, capitalist and developing countries. This broad representation, as well as the procedure for coordinated approval of decisions adopted in the Committee, without voting, has permitted it to become an important forum for discussion of political, legal and scientific-technical questions arising in the process of cooperation.

In a resolution of the UN General Assembly, which it adopted at the XVI Session in 1961, it is stated that the UN must serve as a center for international cooperation in exploration and use of space for peaceful purposes. The UN Committee on Space fulfills the role of this center in the UN system.

Initially, great difficulties stood in the way of the Committee, caused by the efforts of the U.S.A. to secure for itself, in one form or another, a predominant position in the Committee itself and its agencies. The Soviet Union, appealing for the initiative to set up broad international cooperation in mastery of space through the UN, achieved agreement that this cooperation would be based on equal rights. Since the problems with which the UN Committee on Space is occupied are closely tied to important aspects of guaranteeing the safety of the states, the principle of equal rights in the organization and functioning of this body is of fundamental importance. It is completely natural, therefore, that the Soviet Union and other /92
socialist countries, as well as India and the U.A.R. refused to participate in the work of the Committee, with its initial composition, when, of 18 member-governments of the Committee, 12 were allies of the U.S.A. in military-political blocs.

On 12 December 1959, the UN General Assembly unanimously adopted a resolution, defining the new composition of the UN Committee on Space, in which, on the basis of a compromise solution, all three main groups of states existing in the world were represented. Four more countries joined the 24 governments on the Committee later, at the XVI Session of the General Assembly in 1961. The Committee included Australia, Austria, Albania, England, Argentina, Belgium, Bulgaria, Brazil, Hungary, Egypt, India, Iran, Italy, Canada, Lebanon, Morocco, Mexico, Mongolia, Poland, Rumania, USSR, U.S.A., Sierra Leone, France, Chad, Czechoslovakia, Sweden and Japan.[52]

Although the UN Committee on Space was considered to be constituted formally in December 1959, several more years passed, before the conditions necessary for its normal operation were successfully created and the Committee could proceed to practical activity. The first meeting of the full Committee took place in March 1962.

A number of tasks was placed before the UN Committee on Space, including assistance in further exploration of space, begun during the international geophysical year, dissemination of information, giving assistance in accomplishment of national research programs, and study of legal problems in the mastery of space. The Committee was called on to bring into being close ties with all government and nongovernment organizations, occupied with problems of the study and use of space.

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[52] The XXVIII Session of the UN General Assembly in December 1973 decided to increase the number of members on the UN Committee on Space to 37.

For a more specific study of ways and methods of organizing cooperation, the Committee created two subcommittees of all members: one, for purposes of discussion of scientific and technical problems and the other, on legal problems of cooperation. Later, three /93
special working groups were formed under the Committee: on use of satellites for purposes of navigation, direct broadcasting and study of earth resources from space. In accordance with the authority given it, the Committee presents reports on its activities to the UN General Assembly.

Today, almost 15 years after the founding of the UN Committee on Space, it can definitely be said that its main service is legal regulation of relationships between governments during their space activities. It is precisely within the framework of the Committee, that an agreement, constituting the basis of modern space law was born.

The Committee has had considerably less success in direct organization of international space research programs. Other specially created organizations are occupied with this aspect of activity of governments in space. Similar work also is being carried on, on a basis of bilateral and multilateral agreements. The UN Committee on Space does not have a significant effect on the specific forms of joint space programs.

However, it would be incorrect to underestimate the role of the Committee in this connection, as a catalyst of international cooperation in the scientific and technical field. In particular, the Committee has done important work in organization of international firing ranges under the UN aegis, for launching research rockets.

In 1962, the United Nations organization turned the attention of the governments to the advisability of building international rocket ranges, and it approved the basic principles in conformance with which they should be constituted.[53]

The building of such firing ranges by individual countries or groups of countries must facilitate the deepening of international cooperation in mastery of space and in training of research staffs in the developing countries. The conduct of systematic rocket /94
sounding in the equatorial regions is of particular scientific interest, for research in the fields of meteorology and aeronomy.

The governments of India and Argentina turned to the United Nations Organization, with a request to place the firing ranges built on their territories under its leadership. International groups of scientists, going out to the locations for inspection

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[53]See UN General Assembly Resolution 1802 (XVII) of 14 December 1962.

of the firing ranges, recommended that these requests be met. Based on these recommendations, the General Assembly took the Indian Tkhumba firing range under the UN aegis and, in 1969, the Argentine firing range in Mar del Plata. Brazil also is considering the possibility of founding an international firing range on its territory.

In connection with the organization of international firing ranges, Italy and France have officially declared that the mobile San Marco equatorial firing range and the Kourou space center in Guiana, belonging to them, also can be used for joint international projects under the UN aegis.

Another important measure, acting as a catalyst in development of international cooperation in space, was the calling of the International Conference on Exploration and Use of Space for Peaceful Purposes in Vienna, by the United Nations Organization, in August 1968. The conference, organized on the initiative of the Soviet Union, became a world-wide forum, in which representatives of 78 countries and 13 international organizations summed up the result of the first decade of space research. The main accent at the conference was placed on developing the manner in which the results of this research could assist in solution of practical problems facing the developing countries.

About 200 reports were presented at the conference, heard in 10 subject sessions and during special discussions.

The UN Committee on Space is performing useful work, in coordinating the activities of various international organizations in the field of space research. In particular, surveys of activities and resources of the UN, its specialized institutions and other competent international bodies connected with the use of space for peaceful purposes, regularly published by it, facilitates these purposes.[54] The Committee also is engaged in collection and dissemination of information on the activities of the governments in space. This information is presented on a voluntary basis by about 60 countries. It is published periodically in a series of UN Documents. /95

Since 1962, the UN Secretariat has maintained an official register, in which information reported by the States on items launched into space, is recorded.

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[54]See, for example, "Survey of Activities and Resources of the United Nations Organization, Its Specialized Institutions and Other Competent International Bodies, Connected with the Use of Space for Peaceful Purposes," UN Document A/AC 105/100, New York, 1972.

In the UN General Assembly Resolution, recommending that the States present the UN Committee on Space with information on launches of space objects, through the UN General Secretary, it was not specifically indicated, in what form this information should be presented for recording. For this reason, information recorded in the UN official register and disseminated in the series of UN Documents, differ, both as to form and as to amount of data contained in them.

The UN Committee on Space and its scientific-technical subcommittee has given much attention to finding possibilities of assisting the developing countries in the fields of education and professional training of specialists, as well as in the field of practical use of space technology. The three special working groups mentioned, established by the Committee, have made a definite contribution in this matter. The working group on direct broadcasting, by means of satellites, has engaged in study of both the technical aspects of establishing direct transmission from satellites to individual television receivers, and the social, legal and political consequences of such transmissions. From the technical point of view, the conclusions of the group are reduced to the situation that, while direct transmission from satellites to regular, unadapted television receivers can hardly be put into practice during the next 15 years, transmissions from satellites to relatively cheap, small collective ("communal") antennas will be technically possible in the middle of the 1970's. It is considered that, by this time, transmission to specially adapted domestic television receivers, avoiding collective antennas, will become practical. The restraining factor will be the high cost of both the ground and space link of such a system. /96

Discussion of social questions, connected with direct transmissions from satellites, disclosed the serious concern of a number of governments, that the new technical resources not be used to the detriment of the national interests of the States and not infringe on the universally recognized principle of national sovereignty.

At the third session of the working group,[55] the Soviet delegation presented a document, in which sample provisions of the general principles of use of satellites for direct radio and television broadcasting were formulated. One of the fundamental principles is the requirement that direct broadcasting, by means of artificial earth satellites, to the population of a foreign government be accomplished only with the specific, expressed agreement of the government of this nation.

In working out the document mentioned, at the UN in 1972, the Soviet Union appealed for conclusion of a Convention on the principles of use of artificial earth satellites for direct television broad-

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[55]The first session of the working group met in February 1969, the second in July-August 1969, the third in May 1970 and the fourth in June 1973.

casting by governments.[56] The Soviet plan is based on the fact that development of a new type of communications can assist in bringing peoples together, in expansion of the exchange of cultural values and an increase in the level of education of the populations of various countries. However, the problem is that abuse of this type of communication may convert direct television broadcasting into a source of international conflict and of exacerbation of relations between states. A mechanism for international legal regulation of space activities must insure use of direct broadcast satellites in the interest of progress, mutual understanding and strengthening friendly relations between States.

The working group on navigation satellites conducted its only meeting in July 1967. The conclusions, which the members of the group reached unanimously, might have been briefly formulated thus: /97 the creation of a navigation satellite system or systems, to satisfy the requirements of civil aviation, maritime navigation and giving assistance in solution of other navigation problems is technically feasible, but definition of the functions and technical specifications of such systems still requires a series of studies, experiments and also development of specific requirements and economic evaluations.

Based on these conclusions, the UN Committee on Space asked the International Civil Aviation Organization, the Intergovernment Maritime Consultative Organization and other interested organizations to continue study of the problem of use of satellites for navigation service.

Considering the potential blessings of study of earth resources from space for the economies of all countries and protection of the environment, on recommendation of the Committee on Space, the UN General Assembly constituted a working group on remote sounding of the earth, by means of satellites, in November 1971. It was charged with undertaking a survey of scientific and technical progress in the field of systems and methods of collection, processing and analysis of data obtained from satellites, as well as the economic, social and legal consequences of the use of such systems.[57]

The close connection between the scientific-technical and legal aspects of the cooperation of governments in mastery of space is clearly revealed in the role, which the UN Committee on Space is playing in development of standards of space law. Within the framework of this body, scientists, diplomats and lawyers have the capability of jointly discussing the most complicated problems of

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[56]The plan for an international convention was presented, for inclusion in the agenda of the XXVII Session of the UN General Assembly, 8 August 1972. For the text of the plan, see Pravda, 11 August 1972.

[57]For more detail on these problems, see Chapter 5.

international law, brought forward by the development of advanced fields of science and technology of our time.

Article 13 of the UN Charter obliges the General Assembly to organize research and make recommendations, for purposes of encouragement and progressive development of international law. International space law is one of the branches of international law, arising as a result of scientific and technical progress, similar to the manner in which marine and aviation law arose in their time. Consequently, /98 assistance in the development of space law is among the direct obligations of the UN, in accordance with its Charter. On the other hand, by virtue of the universal nature of its membership and the tasks facing it, the United Nations organization and its agencies, including the Committee on Space, are the most suitable place for international legal regulation of the activities of the States in space.

By consideration of legal questions of the cooperation of States in space, the UN took the initiative, with the most active participation of the Soviet Union. It is precisely our country, having paved the road to space for mankind, which is demonstrating the greatest concern that space not be converted into an arena of international conflicts, but becomes a zone of peaceful cooperation of all the States of the globe.

A great achievement of the UN Committee on Space and its legal subcommittee was development of international agreements, which now are the basis for legal regulation in space: the Treaty on the Principles of the Activities of Space in Exploration and Use of Space, Including the Moon and other Celestial Bodies (1967); the Agreement on Rescue of Astronauts, Return of Astronauts and Return of Objects Launched into Space (1968); and the Convention on International Responsibility for Loss Inflicted by Space Objects (1972).

The signatures of the overwhelming majorities of the States of the globe are on each of these documents, and they contain the most general standards of modern space law and order.[58]

We are witnesses of the practical constitution of new standards of international space law: In conformance with the recommendations

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[58]For detailed history of development and analysis of these agreements, see A. S. Piradov, Kosmos i mezhdynarodnoye pravo [Space and International Law], Znaniye Press, Moscow, 1970; G. P. Zhukov, "Questions of the peaceful use of space in activities of the UNO," in the book OON. Itogi, tendentsii, perspektivy [UNO: Results, Trends and Prospects], Mezhdunarodnyye Otnosheniya Press, Moscow, 1970, pp. 188-228; G. P. Zhukov, Mezhdunarodnoye kosmicheskoye pravo [International Space Law], Znaniye Press, Moscow, 1971.

of the UN General Assembly, the legal subcommittee of the UN Committee on Space is occupied with study and coordination of the projects /99 presented by the States; agreed projects are transmitted to the UN Committee on Space and, through it, to the UN General Assembly, which, joining them to their resolutions, recommends these projects for signing by all interested States.

After working out the three agreements mentioned, the legal subcommittee of the UN Committee on Space proceeded to study of the legal problems of study of the moon, registration of space objects, definition of space and other questions of law, connected with the practical side of the space activities of man.

Beside the Committee on Space and certain other UN agencies, a large group of so-called specialized institutions in the UN system are occupied to one degree or another with questions of cooperation in the mastery of space.

In first place among them, in the amount and bulk of work is the International Union of Electrical Communications (IUE). Space research would be unthinkable without use of electrical communication means. The IUE and its subordinate bodies are concerned with allocation of frequency ranges on an international basis, for various types of space activities and radioastronomy, for the purpose of preventing mutual interference. Radiocommunications regulations, worked out at world-wide administrative conferences are applied to the International Convention on Electrical Communications and acquire the force of an international treaty. The first effort at allocation of frequency ranges for space research was made in 1959.

In June-July 1971, a world administrative radio conference on space communications was convened in Geneva. On the basis of proposals of the IUE member-countries, the conference, at which 100 governments were represented, discussed the entire group of questions connected with use of electrical communications in mastery of space, including the problem of placement of satellites in geostationary orbit and using satellites for direct broadcasting. The radio-communication rules, revised at this conference, became effective 1 January 1973.[59]

The World Meteorological Organization (WMO) is another example /100 of a specialized UN institution, on which space research has had a great effect. The World Weather Service and Program of Investigation of Global Atmospheric Processes, the two basic long-term projects of the WMO, depend to a decisive extent on the use of artificial earth satellites.

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[59]The concluding acts of the World Administrative Radio Conference on Space Communications, signed in the name of the USSR in Geneva on 17 July 1971, were approved by the USSR Council of Ministers on 5 January 1973.

The specialized UN institution on questions of education, science and culture (UNESCO) is showing greater and greater interest in use of space technology. In particular, a specially created group of experts has been engaged for a number of years in development of principles and areas of activity of UNESCO in application of space communications resources to educational, scientific and cultural purposes.

The use of satellites for purposes of navigation, radio determination of aircraft and ship locations and traffic control is within the sphere of interest of a International Civil Aviation Organization (ICAO) and the Intergovernment Maritime Consultative Organization (IMCO). The latter of these organizations has done considerable work in discussion of technical, economic and legal aspects of international satellite systems for servicing maritime navigation. The final purpose of these discussions is preparation of a plan for international agreement on creation of a system of satellites, which will assist navigation safety, efficiency and economy in operation of ships and improvement of communications with ship passengers and crews.[60]

The Food and Agriculture Organization of the UN (FAO) assists development of international cooperation in use of satellites for study and protection of earth resources; the World Health Organization (WHO) is interested in the possibilities of application of the latest achievements in the field of space biology and medicine to public health.

The specialized UN institutions mentioned here, as well as others, contribute to development of international cooperation in space, mainly by means of exchange of information, coordination of national research programs or initiation of international projects. Some of them, especially the IUE, perform important international control and regulation of functions in their fields. Not a single one of these organizations is involved in direct activity in space. /101

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[60] In 1972, at the second session of the IMCO group of experts on maritime satellite communications, the representative of the USSR set forth model principles of establishment of an International Organization on Maritime Satellite Communications and Radio-Location Systems.

2. COSPAR and the International Federation of Astronautics[61]

The International Committee on Exploration of Space is widely known in scientific circles by its abbreviated name COSPAR. It was established in 1958, to continue the work of cooperation in exploration of space, after completion of the International Geophysical Year. COSPAR came into existence under the laws of a special committee of the International Council of Scientific Unions, the organization, on the initiative of which the International Geophysical Year was conducted. This left its imprint on the structure and forms of activities of COSPAR. The members of COSPAR are the academies of science and scientific institutions which are the equal of them, of over 30 countries, as well as the following 11 organizations in the International Council of Scientific Unions: the International Astronomical Union, the International Geodetic and Geophysical Union, the International Union of Theoretical and Applied Chemistry, the International Union of Theoretical and Applied Physics, the International Union of Biological Sciences, the International Union of Theoretical and Applied Mechanics, the International Union of Physiological Sciences, the International Biochemical Union, the International Scientific Radio Union, the International Mathematical/102 Union and the International Union of Theoretical and Applied Biophysics.

Each of these scientific unions is concerned with one aspect or another of space research. Participation of the unions in the activities of COSPAR permits it to take the interests of various sciences into consideration, in examination of the results and plans of scientific research in space.

The principal authorities of COSPAR are the General Assembly, Executive Council and Bureau. Functions of the General Assembly include: determination of plans of scientific activity of the Committee; establishment of working groups, for study of special problems and the working out of appropriate recommendations by them; selection of officials; budget approval, etc.

In the intervals between General Assemblies, the activities of the Committee are directed by the Executive Council, which includes seven representatives of the scientific institutions of the countries, elected by the General Assembly, and one representative from all the

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[61]For more detail on the history of formation and activity of these organizations in the initial period, see V. S. Vereshchetin- "International scientific organizations in the field of space research," in the book Kosmos i mezhdynarodnoye pravo [Space and International Law], IMO Press, Moscow, 1962, pp. 153-170. Activities of these organizations are related in a popularized way in L. P. Markelova, Kosmonavtika v puti [Astronautics on the Way], Znaniye Press, Moscow, 1972.

member scientific unions of COSPAR. The Executive Council can assemble in a narrow structure, the seven elected members, who form the Bureau. All decisions of the Executive Council are considered to be adopted, only in case they are approved by a two-thirds vote of the elected members.

It is specially stipulated in the Charter, that the method of selection of COSPAR officials (president, two vice presidents and four Bureau members) must be such as to insure representation corresponding to the distribution of the basic efforts in space research among the COSPAR members. In accordance with this provision, the rules of procedure provide for a special order of selection of officials, by which one of the vice presidents of COSPAR is elected by the General Assembly, from among candidates presented by the USSR Academy of Sciences and the other, from among the candidates presented by the U.S.A. National Academy of Science. Two members of the Bureau are elected from a list of candidates presented by one vice president and two more, from a list of candidates presented by the other vice president. The president is selected from among candidates presented by the Executive Council or directly by the General Assembly.

The basic mission of COSPAR is "assisting, on an international/103 scale, the progress of all types of scientific research, carried out by means of rockets or rocket transportation means" (Article I of the Charter). COSPAR is involved only in fundamental scientific research, excluding problems of space technology (construction of rockets, engines, rocket flight control, etc.) from its activities.

Like other international scientific organizations, COSPAR does not directly conduct space research. At its sessions, the results obtained are discussed and recommendations are worked out for planning and coordination of scientific experiments performed according to national and international programs. COSPAR does not have the right to make any binding decisions, concerning national scientific research programs.

The basic scientific activity of COSPAR takes place in its seven working groups. At the annual organized meetings of these groups, exchange of information takes place on space research programs accomplished and planned. The recommendations of the working groups are authoritative opinions of an international group of scientists in a specific field of space science.

The first group is concerned with scientific problems of satellite tracking, by means of optical and radio facilities, as well as with study of the dynamics of motion of satellites. It keeps a list of tracking stations, which is published in the COSPAR Information Bulletin. The group has prepared a special manual on building optical tracking stations. The group gives much attention to prepartion of international cooperative programs in the field of space geodesy.

The second and fourth working groups of COSPAR are concerned with analysis of results and coordination of scientific experiments,

studying the interplanetary medium, the magnetosphere and upper atmosphere. Previously, the activities of one of the groups was connected with the conduct of the International Year of the Quiet Sun and the World Magnetic Survey. At the present time, it is participating in development of a new, large international project, to study the magnetosphere, conduct of which is planned for 1976-1978. A result of the work of the fourth group was working out the so-called international reference (or standard) atmosphere, into /104 which information, important for experimenters and workers, on the mean characteristics and composition of the atmosphere at various altitudes and their variations, connected with time of day, season, phase of solar activity, etc., are incorporated.

The moon and planets of the solar system are the subject of study of the seventh working group. Problems of application of space technology to solution of astrophysical problems, including prediction of solar outbursts, are the concern of the third working group. The sixth working group assists in international cooperation in use of satellites and rockets for meteorological purposes and for study of the earth from space. In particular, coordination of rocket sounding of the atmosphere in various countries is accomplished with its aid. Finally, still another COSPAR group (the fifth) has investigation of problems of space biology as its mission.

The activities of the COSPAR consultative group on problems of potential harmful consequences of experiments conducted in space benefit from their reputation. This group, constituted in 1962, acts as the principal center of the International Council of Scientific Unions for examination of the consequences of experiments in space, which may present a danger, from the point of view of change in the natural environment or cause interference in subsequent research. The recommendations of the group, after their approval by the COSPAR Executive Committee, are widely disseminated in various countries and international organizations. In particular, this group has given much attention to measures to prevent microbiological infection of the earth and planets during space experiments.

COSPAR is conducting useful work in organization of operationally significant notification of countries of satellite and research rocket launches, registration of space objects, and also exchange of scientific information between world geophysical data centers, established as early as the period of the International Geophysical Year.

COSPAR sessions are held annually, in various countries. During these sessions, beside the scientific and organization meetings, the General Assembly of COSPAR members is conducted, at which reports of national scientific institutions and international organizations are presented, on the result of space research conducted during the year /105 In this manner, a summary of work carried out all over the world in study of space is furnished annually at the COSPAR sessions.

The USSR Academy of Sciences has been a member of COSPAR from the time of its foundation. Soviet scientists participate in the activities of all its working groups. The XIII Session of COSPAR took place in Leningrad in 1970. This was the most crowded meeting in the entire history of COSPAR. More than 900 scientists from 31 countries assembled in the Tavricheskiy Palace.

Another nongovernment scientific organization, which is actively assisting in broad international exchange of the results and plans of the growth of space science and technology is the International Federation of Astronautics.[62] The Federation came into existence in 1950, as a union of eight national societies interested in problems of rocket construction and space research. According to the intention of its founders, the International Federation of Astronautics should have become the organ, which permits the efforts of many countries to be concentrated, for preparation and subsequent accomplishment of interplanetary flight.

In the first charter of the Federation, adopted in 1952 in Stuttgart, it was specified that the Federation "sets its goal as facilitation of the foundation of an International Astronautical Scientific-Research Institute, the mission of which would be accomplishment of space flights for nonmilitary purposes" (Article 6). Although this mission has remained unrealized and, apparently, cannot be realized by the efforts of the international public organization, the Federation has an important role in development of international cooperation in space research. Its activity increased particularly after the launch of the first artificial earth satellite.

At the present time, the Federation is guided by a charter adapted in 1961, with changes incorporated in 1968. It joins about 60 national astronautical societies from 36 countries. Each country can be represented in the Federation by several national societies, /106 but only one of them has the right to vote in the guiding bodies. A provision is fixed in the charter, in accordance with which, in selection of the guiding bodies, the Federation must take into account the roles of countries in space research, as well as the principles of true geographic representation.

The highest body of the Federation is the General Assembly. It includes one representative from each member of the Federation. The assembly gathers annually in different regions of the earth, simultaneously with the international astronautical congesses. During the intervals between meetings of the assembly, current work is directed by the Bureau.

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[62]For the history of foundation of the Federation, see A. G. Haley, Space Law and Government, New York, 1963, pp. 343-380. See also the brochure International Astronautical Federation, Paris, 1971.

Several permanent committees have been established within the Federation: on bioastronautics, on problems of education, on applied purpose satellites, on publications, etc. The first of the committees mentioned is concerned with problems of space biology and medicine, and it is responsible for the program of work of the corresponding sections of the astronautical congresses. The committee on problems of education organizes special symposiums, devoted to study of problems related to instruction in various disciplines connected with space science and technology. The committee on applied purpose satellites has organized a series of multilateral discussions on use of various types of applied satellites.

The annual international astronautical congresses conducted by the Federation occupy the central place in its activity. The first of these congresses met in Paris in 1950. Scientists and specialists of practically all countries carrying out work in the field of space research meet at the congresses. The subjects of the reports presented to the congresses, as a rule, encompass an extensive group of scientific and technical questions, connected with study of space, including questions of a social and legal nature.

The Federation has close connections with a number of intergovernment organizations. In particular, it has been given consultative status by UNESCO and UN Economic and Social Council. In 1971, the UN General Assembly gave it the status of observer in the scientific-technical subcommittee of the UN Committee on Space.

Soviet scientists have taken part in the activities of the /107
Federation, beginning with its VI Congress (1955). In 1956, at the VII International Astronautical Congress in Rome, the Commission on Interplanetary Communications of the USSR Academy of Sciences was accepted as a member of the Federation.[63] In October 1973, the XXIV International Astronautical Congress met in Baku.

Within the framework and under the guidance of the Federation, the activities of two more international organizations formed in 1960 take place. They are the International Academy of Astronautics and the International Institute of Space Law, which includes scientists, elected for life, known for their services in the field of astronautics and space law.[64]

Basic to the activities of the Academy and Institute is organization of scientific meetings and conferences, which are conducted

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[63]This commission was later renamed the Commission on Exploration and Use of Space.

[64]In 1973, more than 450 members and associate members were counted in the Academy and about 400 members from 50 countries in the Institute.

in parallel with the astronautical congresses, as a rule, and publication of the proceedings of these conferences. Thus, under the direction of the Institute, 16 international colloquia on space law have met, which have facilitated the scientific working out of the most complicated problems of space law. A considerable number of scientific symposia on various problems of astronautics have been conducted by the Academy. Such publications of the Academy and Institute as the fundamental dictionary on astronautics in seven European languages, the journal Astronautica Acta, the annual bibliographies on space law and others, enjoy a wide reputation.

The International Federation of Astronautics is a rare case of a public international organization, in which representatives of the natural and social sciences gather together, within the framework of the same international congress. Problems of law, education and history of astronautics are discussed at these congresses, simultaneously with the newest problems of space science and technology. Such multiple agenda meetings and interdisciplinary discussions are enriching science and assisting in development of international cooperation.

CHAPTER 5

ACHIEVEMENTS OF ASTRONAUTICS IN THE INTEREST OF MAN

Space must serve man. This truth has become universally /108
acknowledged in our time. We have already stopped seeing spacecraft as wonders. We more and more often see satellites as workers, who must return "their debt" to people. And they actually are paying generously for the clots of human thought and toil invested in building them.

Communications, meteorology, navigation, earth resources reconnaissance -- these are only a part of the fields of economic activity of man, which already are unthinkable now, without using the resources of space technology. Together with Moscow television programs, space comes into the homes of millions of Soviet people, living many thousands of kilometers from Moscow. During the next weather forecast, we do not ponder over the fact that the Meteor satellites assisted in compiling it.

According to calculations made in America, more than 2500 major technical improvements have arisen recently, as a result of the growth of the space industry.

From the fact that space has solidly entered into the daily life of man, the task of mastering it has not become less difficult. This is the great common affair of all the peoples of the earth. It requires tremendous physical expenditures and the concentration of all scientific and technical resources. In the sphere of practical applications of astronautics, extensive international cooperation, which is becoming an indispensable condition for the very existence of some applied space systems, is of especially great benefit.

However, since this field of space activity directly involves the political and economic interests of the governments, international legal problems, which have to be solved in organization of cooperation, have become especially acute. Some of these problems are the concern of this chapter.

1. Space Communications Systems

In Moscow, on 15 November 1971, the communications ministers of nine socialist countries signed an Agreement on Establishment of an International System and the Intersputnik Space Communications Organization.[65] An important stage in preparatory work to establish

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[65]See Appendix.

a new international space communications system, called on to provide the needs of the countries served by it for telephone-telegraph communications channels, color and black-white television and other types of information transmission through artificial earth satellites was completed by this.

The proposal to create the international Intersputnik organization was promoted by the socialist countries in August 1968, in Vienna, during the UN Conference on Exploration and Use of Space for Peaceful Purposes. In the succeeding years, technical, economic and legal questions in establishment of Intersputnik were discussed at sessions of permanent working groups on space communications, existing within the framework of the multilateral cooperation of the socialist countries in the Intercosmos program. As a result of these discussions, certain changes and refinements were incorporated in the initial draft of the Agreement.

Intersputnik was established as an international, intergovernment organization. Its members at the present time are the governments of Bulgaria, Hungary, GDR, Cuba, Mongolia, Poland, Rumania, Czechoslovakia and the Soviet Union.

Membership in the Organization is open to all interested governments, which share the goals and principles of the Organization and assume the responsibilities flowing from the Agreement.

Intersputnik is engaged in questions of planning, building, operation and development of international communication systems through artificial earth satellites. This system will consist of two main components: space, including satellites and means of controlling satellites in orbit, and ground, including the stations which carry out mutual communications through the satellites. /110
A space complex can belong to the Organization, by the rights of ownership or lease; ground stations are the property of the governments or operating organizations.

The common resources of the Organization, as a rule, can only be expended on a space complex; the ground stations are built, by means of the resources of the corresponding governments or operating organizations (government or private) .

Article 5 of the Agreement provides for a staged building of the system. The first stage encompasses conduct of tests by members of the Organization in their ground stations, using communications channels, which are furnished free of charge by the Soviet Union in its satellite communications. The second stage proposes use of the satellite communications channels under lease conditions. The third is the stage of commercial operation of the communication system.

The difference between the second and third stages is that, in the second stage, members of the Organization can consider it economically more advisable to use only a portion of the communications channels of satellites of members existing at the time, by lease

rights, and not to lease or build the entire space complex for themselves. The times for transition to the third stage, in which the entire space complex belongs to the organization by ownership or lease rights, are determined by members of the Organization, depending on economic advisability.

The launch of communications satellites, which are property of the Organization, and control of them in orbit is accomplished, on the basis of special agreements with the members of the Organization.

The staged building of the system determines the order of acquisition of the financial resources of the Organization. Initially, only a special annual budget is made, by means of which the expenditures for maintenance of the management and other administrative measures are covered. When it is determined that the Organization needs to lease or build its own space complex, the prescribed fund of the Organization are made up, the amount of which will be determined by a special protocol. The participating share of the countries making up the prescribed fund is proportional to the degree of use of the communications channels by them. Profits obtained from /111
operation of the communication system will be distributed among the members of the Organization, in proportion to their payments.

The main bodies of Intersputnik are the Council and the Board of Directors. Besides, the creation of an auditing commission is contemplated, to monitor the financial activity, as well as other auxiliary bodies, at the discretion of the Council.

The Council is the main authority. It includes one representative of each of the members of the Organization, each of whom has one voice. The princple of "one country -- one voice" guarantees the most democratic procedure for direction of the Organization, and it corresponds to the international legal nature of its activity. All fundamental questions are within the scope of the Council, sessions of which are conducted at least once a year.

The Agreement determines that the Council must attempt to make its decisions unanimously. In the absence of the unanimity, the decision is considered to be accepted, when it is given at least two-thirds of the votes of all members. In the latter case, however, a decision of the Council is not obligatory for those members, who have not spoken out for its adoption and have declared reservations to it in written form. These members can subsequently associate themselves with the adopted resolution.

The first session of the Council, with participation of plenipotentiaries of all members of the Organization, was held in Moscow, in November 1972. An extensive group of questions was discussed at it, including technical ones, connected with building the system, and administrative ones, concerning formation of the Board of Directors and of financing the Organization in its initial period of activity.

The Board of Directors is the permanent executive and administrative body of Intersputnik. It consists of a Director General, elected by the Council, for a period of four years, with the right of reelection, and Assistant Director General, who is elected for the same period, but without the right of reelection, and the necessary personnel, selection of whom takes place, with consideration of the professional competence and proper geographic representation. The Board of Directors is staffed by citizens of the countries in the Organization. The Director General and his assistant cannot be citizens of the same State.

The Board of Directors of the Organization is an international /112
body, with clearly expressed executive functions. It is entirely accountable to the Council, as the main authority of Intersputnik.

The seat of the Organization and its Board of Directors has been established in Moscow.

In operating the space complex, the Organization distributes the communications channels among its members, based on their needs. The communications channels distribution plan is approved by the Council. The Organization can lease communications channels in excess of the total requirements of all of its members to other users. The procedures and conditions for use of the communications channels by other users also are determined by the Council. In this case, it is noted in the Agreement that the tariffs for use of the communications channels must be at the average world level.

Thus, use of the Intersputnik system, in principle, is open not only to members of the Organization, but to other users, both national and international. Of course, an indispensable condition for use of the system will be conformance of the technical characteristics of the ground station to the requirements of the Organization.

The Agreement does not limit the rights of member countries of the Organization to participation in building or operating other national or international space communications systems, giving them relatively complete freedom in this respect. It does not exclude the possibility of interaction of the Intersputnik system itself with other communications systems.

It is noted in the text of the Agreement that the Organization coordinates its activities with the International Union of Electrical Communications, and it also cooperates with other organizations, the activities of which concern the use of communications satellites, both in the technical aspect and in questions of international regulation. Special mention of the International Union of Electrical Communications, as an organization with which Intersputnik coordinates its activities, is explained by the important role of this organization in regulation of a number of technical problems of space communications, including use of the frequency spectrum.

Practical work on building of the Intersputnik system began even before the Agreement on establishment of the Organization and formation of its main bodies went into effect. The permanent working group on space communications, within the Interkosmos program, was engaged in planning and coordination of this work. /113

A draft technical plan was worked out, providing for two versions of construction of the communications system. One of them was based on the group of countries which had signed the Agreement at that time, and the other encompasses a considerably larger area of the surface of the earth, and can be used to increase the number of governments included in Intersputnik. These versions differ from each other in the number of satellites, the power of the relays installed in the satellites, and certain characteristics of the ground stations.

In the first stage of operation of the system, Soviet Union Molniya type communications satellites will be used, in elliptical orbits, with an apogee of about 40,000 km, perigee of about 500 km, angle of inclination 63.5° and period of revolution around the earth of 12 hours. One such satellite is sufficient to include the territories of all the present member countries of the Organization. Simultaneous placement of several Molnya type satellites in orbit will provide communications around the clock.

The use of geostationary satellites is proposed for the future. It is planned to locate one of them above the equator, in the area of Longitude 35° East.

Construction of ground space communication stations is being carried out in nearly all member countries of the Organization. They will have the same type of equipment, operating in the 4 and 6 GHz range, and they will be intended for receiving and transmitting black and white and colored television with the audio, and duplex telephone communications. The diameters of the station antennas are 12 or 26 m.[66]

For a period of several years, scientific research and test-design work on a number of selected subjects has been successfully carried out in countries signing the Agreement. The results of the work performed are being used to build the space complex and ground stations of the system. Financing of this work at a given stage is done directly by the countries and, in the future, it will be covered by means of the common prescribed fund. /114

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[66]See I. Ya. Petrov, "Agreement on 'Intersputnik' -- an important act of international cooperation," Vestn. svyazi 8, 30-31 (1972); I. Ya. Petrov, "Establishment of the international 'Intersputnik' organization," Elektrosvyaz 5, 70-71 (1972).

The Organization and Intersputnik space communications system are in the formative stage. The technical parameters of the systems are being precisely defined, and the ground stations are being built. The international legal side of the activities of the Organization is being further developed. The necessity for working out and approving certain additional legal documents is directly provided for in the Agreement on Intersputnik.

Intersputnik, as is fixed in its founding Agreement, is built on the basis of respect for sovereignty and independence of the governments, equal rights, noninterference in internal affairs, and also mutual assistance and benefit. It is called on to assist in strengthening development of all-around economic, scientific-technical and cultural relations between its members.

In 1964, on the initiative of the United States of America and under its control and direction, an international space communication system through artificial earth satellites, Intelsat, was established, which now includes a large number of states located in various parts of the globe. In 1971 in Washington, after three years of discussion at diplomatic conferences, going through several rounds, the so-called "final agreement" on organization of Intelsat was signed.

What are the fundamental differences in the political and legal principles, on which Intersputnik and Intelsat are based? Why was the parallel building of two international systems and space communications organizations necessary?

The organizational principles of Intersputnik correspond completely to the founding principle of modern international law, the sovereign equality of all states. It is specifically manifested, in particular, in the articles of the Agreement, defining the composition, authority and method of voting in the highest authority of Intersputnik, the Council.

In Intelsat, there initially was no body at all, in which all governments participating in this communication system could be represented. The authority of the Intelsat consortium was a committee, the representation and voting in which depended on the capital /115
investment, on the basis of the principle of so-called weighted voting. A number of countries, which had paid their money to build the system, were practically completely eliminated from the management, and the U.S.A. had 53 percent of all votes.

The requirement that management of Intelsat system activities be carried out, according to the principle of "one country -- one vote" was widely supported in the diplomatic conferences in Washington, during revision of the provisional agreements on Intelsat. Nevertheless, according to the new agreements, despite the establishment of an assembly, which includes all members of Intelsat, the real power, as usual, belongs to a governing body with a limited number of representatives, in which the U.S.A. has 40 percent of the votes available, and in which the votes of the other members are

distributed, depending on the capital invested.

In practice, the activities of international organizations have long confirmed the principle, in accordance with which the administrative and executive functions are performed by an elected international body, subordinate to the main authority.

In the Intersputnik organization, the Board of Directors is entrusted with these functions; it is elected for specific periods, from among the citizens of the member countries of the organization, and it works under the direction of the Council.

The functions of the manager of Intelsat are performed by the American communications satellite corporation, Comsat, which wears three hats simultaneously: manager of Intelsat, representative of the U.S.A. in the Intelsat authoritative body and a private corporation, operating for the sake of extracting profits. In other words, questions of planning, construction and operation of the international communications system is not in the hands of an international body, but of a private American company. This situation, directly affecting the political and economic interests of the members of Intelsat, caused sharp criticism at the Washington conferences.

The maximum concessions, which the members of Intelsat succeeded in gaining, were a promise to reexamine the place and role of Comsat in the Intelsat system and, six years after the final agreements on Intelsat become effective, to create an international body controlling the system.

International cooperation on the basis of equal rights in the /116
field of space communications means that any country or group of countries can participate in national or international communications systems, through artificial earth satellites, along with participation in a world-wide communication system.

The Agreement on Intersputnik does not deprive its members of the possibility of participating in other communications systems through artificial earth satellites. The approach of the United States of America to this question can be judged by the American plan of the final agreement on Intelsat, promoted during the first round of the Washington conferences. In one of the articles of this plan, it is proposed to forbid members of Intelsat to participate in building or use of other international space communications systems, under the threat of exclusion from Intelsat. This could not be considered as other than an attempt to secure a monopoly in international communications through artificial earth satellites for Intelsat, in complete contradiction with standards of international space law. It is not surprising that this proposal aroused opposition on the part of many members of Intelsat. However, the U.S.A. succeeded in including a stipulation in the text of the new agreement, depriving members of Intelsat of the possibility of independently deciding questions of their participation in other space communications systems. An indispensable condition of such participation

is to obtain a decision of the Intelsat authorities that such systems are technically compatible with Intelsat and cannot cause it "significant economic harm."

What these limitations lead to in practice is shown by the long and stubborn argument between the U.S.A. and the western European countries, on the conditions of sale of American rockets for launching European communication satellites.

A communication system laying claim to global scope, by the logic of things, should have a universal nature, i.e., be open to all countries of the world. However, despite the goals proclaimed, Intelsat allows only members of the International Union of Electrical Communications in its ranks. This discriminatory measure was directed against the socialist group of States, entry of which into Intelsat, just like in other international organizations is stubbornly /117 opposed by the United States of America, for political considerations.

Concerning the Intersputnik organization, it is open to all countries of the world to join, without any limitations at all.

As we see, the important organizational and legal principles of the Intelsat system are of a discriminatory nature, and are incompatible with the sovereign equality of States, and they contradict the provisions of the 1967 Treaty on Space and a number of resolutions of the UN General Assembly. It is natural that, under such conditions, the socialist countries could not join the Intelsat organization, despite all the advantages of creating a single global space communications system.

In 1968, when nine socialist countries came out with the Intersputnik plan, it still was not clear how subsequent development would proceed: by way of formation of a single global communication system through artificial earth satellites, built on principles corresponding to the interests of all countries, or by way of building several international communication systems. Now, after the new agreement on Intelsat has become effective, the agreements on Intersputnik and approval of the plans for building a European communication system, have clearly defined the second way. Not one of the international systems is universal. Consequently, it can be assumed that the necessity for their interaction will arise in the future.

The interaction can be achieved, for example, by way of use of satellite communications channels by countries not in a given system.

Technical compatibility of the different systems is of great importance. However, this problem cannot be solved, by way of dictation or adherence of any side to its standards, but it requires agreement and consideration of the interests of all participating countries.

In creating different types of space communication systems, it also is necessary to avoid mutual interference in use of radio frequencies in placement of satellites in orbit. In this matter, as in solution of other technical problems, the International Union of Electrical Communications and the mechanism of regulation of such problems created within the framework of this union, play an important role.

Problems of building, operating and coordinating international /118
satellite communication systems are not limited to the group of problems faced by the governments with the appearance of communication satellites. No less acute problems, requiring broad international cooperation and mutual understanding between governments, have been revealed by the prospect of use of artificial earth satellites in the immediate future, for purposes of direct television broadcasting, the transmission of television programs through satellites, directly to the home receivers of television viewers.

Concern that this new, progressive technical means of mass transmission of information will be used to bring the peoples closer together, and not to kindle conflicts between them, dictated the proposal of the Soviet Union to work out in the UN a Convention on the principles of use of artificial earth satellites by States for direct television broadcasting, which has already been spoken of in Chapter 4.[67]

The first national communication system through artificial earth satellites in the world was build in our country in 1967. Molniya type satellites and Orbita ground stations, now located at more than 40 places, allowed the most remote regions in the Soviet Union to communicate frequently and effectively with Moscow. However, the nature of communications is not only a national, but an international affair. Therefore, together with further improvement in its intra-State communication system, the Soviet Union is actively assisting in development, on the basis of equal rights and democracy, of all types of international communications through space.

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[67]On problems of direct broadcasting, see Yu. M. Kolosov, "Mass information and international law," Sovetskoye gosudarstvo i pravo 11, 89-95 (1972); L'utilization de satellites de diffusion directe [Utilization of Direct Broadcasting Satellites], Universitaries de France Press, Paris, 1970; Jan Bušak, "Prospects of direct television and radio broadcasting by satellite," XV Colloque de droit spatial [XV Colliquium on Space Law], Vienna, October 1972, Mimeo, p. 8; E. Pépin, "Legal aspects of direct broadcasting by satellite," Impact of Science on Society 21/3, 243-251 (1971).

2. Satellites and the Weather Service

The productive activity of people still depends, to a great extent, on meteorological conditions. Agriculture, many industrial enterprises, all types of transportation, hydroelectric power stations, communications lines and electric power transmission systems need timely and reliable weather forecasts; hence the continually increasing requirements for improvement of existing methods of forecasting.

One of the serious difficulties here consists of the fact that a network of ground stations, conducting constant observations of the weather, cover only one-fifth of the surface of the earth with sufficient density, and the remaining four-fifths are in the Pacific Ocean and desert regions, which are difficult to reach and slightly populated.

The air masses and atmospheric vortices affecting the nature of the weather, can move from 2,000 to 2,500 kilometers in one day. This means that, for compilation of weather forecasts at any point, only one day ahead, meteorological observations around a given point, in at least a 2,500-3,000 km radius, have to be analyzed and, for compilation of long-range forecasts, a detailed study of the processes taking place through the entire thickness of the atmosphere above the entire territory of the earth is required. In this case, certain important characteristics of the state of the atmosphere, such as, for example, the radiation balance or structure of cloud systems, in general cannot be obtained, by means of regular ground facilities.

A new page has been opened in the history of meteorology, by use of artificial earth satellites by the weather service, permitting regular systematic observations over the entire globe to be carried out.

The Meteor space system, consisting of meteorological satellites and a set of ground equipment, has been operating successfully in the Soviet Union for a number of years. An experimental meteorological system of two satellites and ground equipment for reception and machine processing of data began to operate in 1967. Information coming in from the satellites includes images of the cloud cover on the day and night sides of the earth, as well as data on the heat energy reflected and radiated by the earth and the atmosphere. These data are quickly transmitted to meteorological institutions and /120
forecast centers of the Soviet Union and other countries, to take into consideration in compiling weather forecasts. Special communications channels permit weather maps, charts and photographs of the cloud cover and other data to be transmitted by wire or by radio. One such international communications channel, the operation of which began as early as 1964, exists between Moscow and Washington.

The appearance of Soviet and American meteorological satellites, revolutionizing the weather service, required a new approach to international cooperation in this field. Organization of it was

assisted by the fact that use of satellites for meteorological purposes, in distinction from space communications, did not require creation of specialized international organizations and did not encounter serious international legal difficulties. The fact that the weather services of various countries had a century-old tradition of cooperation, within the framework of the World Meteorological Organization (WMO), joining about 140 governments, played an important part.

Beside the resulting great scope of bilateral and regional cooperation, which was discussed in Chapter 2, the meteorological services of nearly all countries of the world have joined for conduct of two global programs of cooperation in the field of meteorology. One of these programs from the World-Wide Weather Service has a direct practical direction, and the second, the Program of Investigation of Global Atmospheric Processes (PIGAP), is pursuing mainly scientific goals.

The use of the artificial earth satellites of the Soviet Union and the U.S.A., as well as the meteorological satellites developed by other countries, will be of decisive importance in carrying out both programs. The World Meteorological Organization and International Council of Scientific Unions, coordinating the execution of these programs, will not themselves build or operate meteorological satellites. This is their fundamental difference from Intelsat and Intersputnik. Global cooperation in meteorology has been organized in such a way, that the intergovernment and public international organizations are the only place for development, agreement and coordination of international programs, and their practical /121
realization in conformance with the recommendations adopted are almost entirely on the shoulders of national organizations.

The World-Wide Weather Service is thought of as a coordinating activity of all national and international meteorological organizations of the world, having the goal of conducting simultaneous observations over the entire globe, by means of satellites, ground stations and other technical facilities, rapid processing of the data obtained and their timely transmission to all interested governments, for compilation of weather forecasts and conduct of scientific research work.

Each of the three main elements of this global system (data collection, processing and transmission through the electrical communications channels) requires tremendous organizational and scientific-technical work, as well as great material expenses. A considerable time is necessary for training of staffs of specialists (especially in the developing countries), capable of interpreting and using the data obtained from the satellites. Therefore, establishment of the World-Wide Weather Service is taking place in several stages, and it is not restricted by strict timeframes.

The initial plan for 1968-1971 was adopted, after careful preparatory work, but the WMO Congress in Geneva in 1967. The sixth

WMO Congress, meeting in April 1971, approved the revised plan of the World-Wide Weather Service, for the period 1972-1975, in which still greater emphasis was placed on use of artificial earth satellites.

In the first stage of the World-Wide Weather Service, operational meteorological satellite systems of the USSR and U.S.A. provided for observation of atmospheric processes over the entire globe. One example of the successes achieved is the timely notification of such dangerous phenomena as hurricanes and typhoons.

The revised plan contemplates launching geostationary satellites located above the equator, as well as launch of satellites in polar orbits. The USSR and U.S.A. have declared their intention to launch geostationary meteorological satellites. The countries of western Europe and Japan contemplate placing such satellites in geostationary orbit.

The satellite data are sent to three world meteorological /122
centers, established in Moscow, Washington and Melbourne, where they go through appropriate processing and then are distributed over the entire world. Beside minor centers, the World-Wide Weather Service includes a network of regional and national meteorological centers.

In 1962, the UN General Assembly turned to the International Council of Scientific Unions (ICSU), with a request to develop an expanded program of scientific research on atmospheric processes, which would supplement the programs being carried out, under the leadership of the World Meteorological Organization. It was proposed to attract the international scientific unions and national academies of science included in ICSU in this work.

The attention of the UN served as a stimulus for the generation of a new, large international scientific project, the Program of Investigation of Global Atmospheric Processes. The ICSU and WMO, which signed a special agreement on 10 October 1967, are jointly occupied with planning and organization of this program.

The Program of Investigation of Global Atmospheric Processes, or, as it is called for short, PIGAP, has the mission of study of the physical processes in the troposphere and stratosphere, knowledge of which will facilitate increasing the accuracy of forecasting and improvement of the understanding of the physical bases of the climate. For this purpose, using computer methods, a series of theoretical models of the atmosphere will be created, with simultaneous conduct of observations and experiments, to verify the correspondence of these models to reality. In this case, observations, performed within the framework of the World-Wide Weather Service, which, in turn, will be enriched with the scientific results obtained in carrying out PIGAP, will be used extensively. In particular, recommendations may be given, from the results of PIGAP, on the optimum placement of a network of meteorological observation stations.

The PIGAP program contemplates organization of two types of experiments, using artificial earth satellites: tropical and global. The first of them, the Atlantic Tropical Experiment, planned for the summer of 1974, will be concentrated on study of the physical properties of cloud masses in the tropical region of the Atlantic /123
Ocean and the effect of this "weather factory" on the general circulation of the atmosphere. Global experiments, conduct of which is contemplated not earlier than 1977, still are in the planning stage. However, it has already been noted that four geostationary satellites and two or three satellites in polar orbits are required to organize them.

As is clear from the examples presented, international cooperation in the field of space meteorology is of large scope, and it has good prospects; it is added as a necessary component part of the historical common cooperation of meteorologists of all countries, which has been put together.

The use of satellites for meteorological purposes, both on a national and an international basis, has not yet posed serious legal problems. The international legal operating conditions of meteorological satellites does not differ fundamentally at this stage from the general operating conditions of artificial earth satellites for scientific purposes, as they have been determined by effective space law.[68] However, this does not mean that specific problems, requiring international legal regulation, cannot arise in the future in this field. Some of them are already appearing at the present time.

While today, the main efforts of science in practice are concentrated on improvement of weather forecasts, the problem of weather control, of the active action of man on atmospheric processes, may become urgent tomorrow. On limited, local scales, experiments in control of unfavorable weather phenomena are already being carried out in a number of countries. Considerable success in this work, in particular, in measures to protect valuable agricultural crops from hail, have been achieved by the Hydrometeorological Service of the Soviet Union.[69]

If the use of space technology eventually makes possible change of weather and climatic conditions over extensive areas, this /124
unavoidably requires the conduct of preliminary consultation between

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[68]For more detail on this question, see E. G. Vasilevskaya, "Legal problems of space meteorology and international cooperation," in the book Pravovyye aspekty ispol'zovaniya iskysstvenykh sputnikovdlya tseley meteorologii i radiosvyazi [Legal Aspects of Use of Artificial Satellites for Meteorological and Radio Communications Purposes], Nauka Press, Moscow, 1970, pp. 65-102.

[69]See Ye. Fedorov, "From Forecasting -- to Control of the Weather," Pravda, 30 January 1971.

the interested governments and, possibly, conclusion of special international agreements, since active intervention in atmospheric processes on large scales, bringing benefits to some regions, can cause unfavorable changes in others.

The principle of "due consideration of the appropriate interests of all other governments," in carrying out activities in space, has been secured in the Treaty on the Principles of the Activities of Governments in Exploration and Use of Space, Including the Moon and other Celestial Bodies (Article IX) and, thereby, it has acquired the force of a universally acknowledged standard of modern space law. This article of Treaty provides for the appropriate procedure of international consultations, when there is a basis for thinking that an activity or experiment planned by one government will create a potentially harmful interference in the activities of other governments.

Although there is no standard, either in international law in general or in space law in particular, directly referring to actively influencing atmospheric processes, and the provision mentioned on international consultations is not binding, but optional, there is no doubt that modern international law rejects the once current thesis of the legality of anything which is not forbidden.

The famous Polish jurist, M. Lyakhs, noted correctly, in an address to one of the international astronautical congresses: "The old principle that everything not forbidden is approved is not in force today. Freedom of action is determined by the probability of infringing on the rights of others. The limitation of the law and the necessity for cooperation and consultation in all cases, when the activity of a government may affect the rights of others, flows from this. This is especially important, with respect to space."[70]

At the present time, the apparently abstract arguments on legal regulation of types of space activity, not yet being accomplished, /125 may become very urgent in the near future. Further progress in international cooperation in peaceful use of weather satellites, just like in other areas of cooperation in space, is closely connected to the development of mutual understanding and trust between peoples.

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[70] Doc. IAA/Sci. Leg. Ctee/11, International Academy of Astronautics, November 1970.

3. Study of Natural Resources from Space

The use of space resources, for purposes of study of the natural resources of the earth, is developing great possibilities, for many fields of practical activity of man.[71]

In the field of agriculture, there is the problem of obtaining regular information on the conditions of plantings and pastures, and on the size and nature of agricultural plant diseases.

The study from space is assisting geologists in discovering geological structures containing useful minerals, in better understanding the regularities of the structure of the earth's crust and location of mineral and other riches of the earth.[72]

According to present calculations, one satellite photograph can replace 3,200 regular aerial survey photographs.[73] The importance of this can be judged by the fact that reliable and detailed maps still have not been provided for more than two-thirds of the surface of the earth.

Hydrologists can more accurately determine the sizes of areas covered with snow, the content of moisture in the soil and the intensity of precipitation. Observations from space permit more accurate prediction of the water flow after the spring floods, which will be of great importance for increasing crop yields, efficiency in use of hydroelectric power stations and for control of flooding.

In the field of oceanography and fisheries, space equipment can/126 be used for determination of the temperature and state of the sea surface, pictures of the sea currents and ice cover and observation of icebergs, and for detection of possible fish schools and solution of other problems in the future.

The returns expected from use of space technology resources for study of the natural environment are far from exhausted by the

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[71]B. V. Vinogradov, K. Ya. Kondryat'yev, Kosmicheskiye metody zemlevedeniya [Space Methods of Earth Science], Gidrometeoizdat Press, Leningrad, 1971; K. Ya. Kondrat'yev, Sputniki i problema prirodnykh resursov Zemli [Satellites and the Problem of Earth Natural Resources], Znaniye Press, Moscow, 1971; Issledovaniya prirodnoy sredy s pilotiruyemykh orbital'nykh stantsiy [Study of the Natural Environment from Manned Space Stations], Gidrometeoizdat Press, Leningrad, 1972.

[72]A. V. Sidorenko, "Space and geology," in the book Nauka i chelovechestvo [Science and Mankind], Znaniye Press, Moscow, 1972, pp. 99-111.

[73]G. Pardoe, "Earth Resources Satellites," Science Journal 5, 58-67 (1969).

examples presented. In particular, earthquakes, floods, eruptions of volcanoes and dust storms can be detected in good time from space and, in some cases, be predicted. To find out all the potentialities of study of the natural environment from space still requires the conduct of an extensive set of ground, air and space studies.

The main advantages of space methods of study of earth resources over ground methods and aerial photography, is seen by specialists in three types of integrations, which can be provided for only by space resources: territorial, factorial and dynamic. Territorial integration is the uniting of images of extensive areas on a single photograph, in which, in distinction from mosaics, composed of many aerial photographs, achieves geometric and optical continuity of images and a high rate of producing them. Factorial integration is the combination in a single photograph of different component parts of the natural environment: atmosphere, lithosphere, hydrosphere and biosphere, which permits multiple interpretations of the data obtained to be carried out by specialists in various professions. Dynamic integration is understood to be obtaining sequential images of one and the same territory over specific intervals of time, for study of the dynamics of the natural environment (change in snow and ice cover, plant growth, movement of cloud systems, etc.).

Experimental study of earth resources from space is being carried out in the Soviet Union and the United States of America. Diverse spacecraft are being used here: artificial earth satellites, unmanned space stations and long-term manned orbital stations. The latter are the most promising in the field of study of the natural environment. As was demonstrated by the flight of the first craft of this type, /127
Salyut, then by the American Skylab, observation from aboard an orbital station permits valuable information to be obtained on the development of natural processes.[74]

Equipment, providing for production of photographic and television images, as well as the spectra of various earth and atmospheric formations in the ultraviolet, visible, infrared and microwave wavelength ranges, is used for purposes of study of the natural environment.

Development of specialized satellites is being carried out in the United States of America, for study of the natural resources of the earth, the ERTS satellites (experimental satellites for study of earth resources). The launch of the first ERTS-1 satellite occurred on 23 July 1972. Work is being carried on simultaneously in the U.S.A. in preparation for establishing an operational service, which should provide a global study of earth resources by means of satel-

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[74]B. Petrov, "On the threshold of new achievements," Pravda, 4 July 1971.

lites by the middle or the end of the 1970's,[75] although the problems and organizational principles of establishing such a service or system still are far from clear.

Before carrying out the appropriate experimental completion of satellites for study of natural resources, development of the most promising methods and programs, which are ripe for practical realization, performance of the necessary preparatory work in the countries, for the purpose of rapid and multipurpose use of the data obtained, as well as development of the corresponding international legal mechanism, it would be premature to speak of establishing an operational service for study of natural resources from space.

Registration of the data obtained from satellites on earth, and then processing and interpretation of the tremendous volume of information now is within the reach of only the highly developed countries. The absence of costly receiving stations, qualified staffs, capable of decoding the information received, and the computers necessary for data processing does not now permit the developing countries to effectively use information from satellites, even if it were presented to them. /128

It is precisely these considerations which have caused the fear, expressed in the world press, that the use of satellites for study of the natural resources of other countries might be converted into a form of legalized economic espionage, and that developing countries would become a passive object of study, the results of which can be used by monopolies, to harm the economic interests of these countries.[76] A number of circumstances indicate that such fears are well grounded.

The problem of equality of interested parties in the division of possible profits, connected with the information obtained from space, is arising in the capitalist world, even as applied to its own territory. Small American companies are uneasy over being in an unfavorable position, compared with the large corporations, as a result of the latter using their capabilities more rapidly and effectively in a competitive battle to process and use data of natural resources, especially geological, obtained from satellites. A reflection of this uneasiness is a discussion in the legal literature of the U.S.A., of the question of how to equalize the rights of large and small companies in use of satellite data on natural resources. The fact itself of widespread primary data, which can have economic and commercial value, still does not serve as a guarantee that the large monopolies, having the appropriate technical

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75John Hanessian and John M. Logsdon, "Earth Resources Technology Satellite -- Securing International Participation," Astronautics and Aeronautics, 56-63 (August 1970).

76"The U.S.A. is conducting economic espionage by satellite," Air et cosmos 270, 18 (1968). See also Flight 94/3098, 140-144 (25 July 1968); Aerospace Daily, 10 (3 March 1970), 37 (6 March 1970); Christian Science Monitor, 2 December 1970.

resources and personnel available for rapid interpretation of these data, they will not use them to damage the economic interests of other countries.

Some American lawyers consider that, besides moral considerations, the governments are not bound by any responsibilities, with respect to commercial use of information on natural resources of foreign countries obtained with the aid of space facilities, even /129
in the event the question is of intentions to acquire foreign territory, to develop its minerals. The prominent American specialists in the field of space law, S. Lay and H. Taubenfeld, write in the book The Law Relating to Activities of Man in Space: ". . . international law is apparently developing in such a way that it permits a government obtaining information (the question is about space information on foreign territories -- V. V.), to use it for its own economic and commercial purposes." "In the absence of agreements, providing for transmission of commercial and economic information, obtained by means of observation from space, it is doubtful that any legal obligation has existed to share such information." Further, the authors say that, even in the case of conclusion of an agreement to acquire territory, for the purpose of developing its mineral resources, the presence of which can be decided upon from satellite information, "There is no obligation to share such information, so that the governments would be in an equal position in concluding transactions."[77]

In these discussions, both the principles set forth in the 1967 Treaty on Space and the sovereign rights of States to their natural wealth, secured in several resolutions of the UN General Assembly, have completely dropped from sight. For example, in the preamble to the 1967 Treaty on Space, it states that "Exploration and use of space must be directed towards the good of all peoples, regardless of the extent of their economic and scientific development." Article I reads: "Exploration and use of space, including the moon and other celestial objects, is accomplished for the good and in the interests of all countries, regardless of the extent of their economic or scientific development, and it is the property of all mankind."

As early as 1952, the UN General Assembly adopted a resolution which proclaimed: "The right of the peoples to freely use and exploit their natural wealth and resources is an inalienable element of their sovereignty, and it conforms to the goals and principles /130
of the UN Charter." The same resolution called on all governments to abstain from direct or indirect actions, which interfere with the exercise of the sovereignty of any State over its natural resources. Subsequently, the UN General Assembly has repeatedly confirmed the sovereign rights of the States over their natural resources in its resolutions. Thus, in Resolution 1803 (XVII), adopted nine years

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[77]S. Houston Lay and Howard J. Taubenfeld, The Law Relating to Activities of Man in Space, The University of Chicago Press, 1970, pp. 187-188.

later, in 1962, it is stated:

"2. Prospecting for and exploitation of such resources and the disposition of them . . . must be carried out, in accordance with the rules and conditions, which the peoples and nations, by their freely adopted decisions, consider necessary and desirable for approval, restriction or prohibition of such types of activity . . . ."

"7. Violation of the rights of peoples and nations to sovereignty over their natural riches and resources contradict the spirit and principles of the UN Charter, and it hinders the development of international cooperation and the maintenance of peace."[78]

The inalienable sovereignty of States over their natural resources must include their sovereign rights to dispose of information about these resources.

The freedom of exploration and use of space in general and, in particular, in the case which we are discussing, wherein the object of investigation is not space itself, but sovereign territories on earth, studied by means of space resources, can, in no case, be set off against the principle of State sovereignty or, what is more, dominate it.

New technical capabilities for study of the earth from space, which were discovered with the appearance of spacecraft and means of remote exploration of earth resources, entails the necessity for development of political-legal guarantees of protection of the sovereign rights of the States over their natural riches. Such guarantees are closely bound to development and strengthening international cooperation on the basis of equal rights, which will permit conduct of some of this work on a bilateral or multilateral /131
basis and decrease the likelihood of abuse, in practical use of the information obtained. In this case, the problems arising will be solved, by means of understandings between the governments.

The first steps on the way to development of international cooperation in this field have already been made. A number of bilateral, scientific-technical agreements have been concluded, on study of earth resources, with the aid of space facilities. For example, in the framework of the general Agreement between the USSR and the U.S.A. on cooperation in the exploration and use of space for peaceful purposes, the conduct of joint work by the USSR Academy of Sciences and NASA is provided for, in study of the natural environment above selected regions of the Pacific Ocean, as well as of each party above its territory, with the aid of space facilities. The

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[78]See also UN General Assembly Resolutions 1314 (XIII), 1958; 2158 (XXI), 1966; 2600 (XXIV), 1969; and 2692 (XXV), 1970.

U.S.A. has concluded a number of bilateral agreements on participation of foreign scientific institutions in ERTS satellite operations. However, while, in distinction from the Soviet-American agreement, research is carried out, not only above their territories and the Pacific Ocean, the fact in itself of conclusion of bilateral agreements is not a proper guarantee against possible violations of the legal interests of other governments. The Bulgarian lawyer, M. Marcoff, properly brought attention to this circumstance.[79]

In 1971, the UN General Assembly, on recommendation of the UN Committee on Space, established a special working group on remote sounding of the earth by means of satellites in it, thereby initiating active discussion of the scientific-technical, economic and legal aspects of the problem in special UN bodies.[80]

The task of space law must consist of finding methods of legal /132
regulation of this type of space activity, which, without creating interference in its development, would prevent the possibility of use of the data obtained to the harm of the economic interests of the State. Solution of this problem can hardly be achieved, by means of working out a common legal policy for the spacecraft themselves, used to carry out study of the natural resources of the earth. As was noted above, this work is being performed or will be performed by manned orbital stations, specialized earth satellites, unmanned space stations and other space items, the legal status of which is varied.

Also, the fundamental differences in the international legal policies of the component elements of the natural environment and the territories subject to study cannot be lost from view. It is one thing, when the matter concerns study of the Pacific Ocean, atmospheric processes or various characteristics of one's own territory, and another completely, if the object of study is the territory of foreign governments. In the first case, problems of sovereignty do not arise, and all governments have the right to carry out such studies and freely dispose of the data obtained (questions which might arise in this case on mainly of an intra-government nature). In the second case, when the investigation is carried out above the territories of other States, the sovereign rights of these States to their territory and natural riches may be

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[79]M. Marcoff, L'etude des ressources terrestres par des objets spatiaux et le droit international [Satellite Study of Earth Resources and International Law], Mimeo, 1972, p. 3.

[80]On the role of the UN in discussion of this problem, see E. Galloway, "The Role of the United Nations in Earth Resources Satellites," Preceedings of the Fifteenth Colloquium on the Law of Outer Space, Davis, California, 1973. At the second session of the UN working group on remote sounding in 1973, the Soviet delegation presented a Model Plan of the principles of use of space technology means by the States for study of earth resources.

affected.

On this basis, should the conduct of study of the natural resources above the territories of foreign governments without their agreement generally be forbidden? Without excluding in principle the legality of this formulation of the question, a number of difficulties must be seen, which would be placed in the path of putting such a prohibition into practice. First, the prohibition is technically difficult to put into practice, since this would require inclusion of onboard equipment each time, during a flyover of the territories of specific States. Second, to control implementation of this prohibition is practically impossible. And, third, such a prohibition could create interference in the conduct of studies of natural processes of a global nature, connected with environmental protection.

Solution of the problem may be found in regulating the pro- /133
cedures for use of information on natural resources, obtained with the aid of space means.

Based on the sovereign rights of States, with respect to their natural resources, and the provision of the 1967 Treaty on Space, the principles, in accordance with which the use of space data on natural resources of foreign governments, first and foremost, data of economic and commercial interest would not be permitted, without the consent and agreement of the States, should have been confirmed in space law. Responsibility for adherence to this principle by all legal and physical persons, on the basis of Article VI of the Treaty on Space, must be borne by the States, as well as the international organizations occupied in space activity. In this case, the States and international organizations must see that information on foreign territory is not published and is not given to private hands or third States, without the agreement of the States, the territory of which was the object of study.

Confirmation of such principles would not create limitations in the way of extensive study of man's natural environment by use of space means and, moreover, would serve as a specific legal guarantee against use of information obtained against the economic interests of the States. Development of extensive international cooperation in the field of use of space methods for study of earth resources, on principles, corresponding to the interests of all governments, is considerably easing legal regulation of this problem.

4. On the Way to International Orbital Stations

The building of long-lived orbital stations, in which man could live and work in space for a long time, is considered to be both an important and a promising means of mastering space. Multiple studies of earth and circumterrestrial space, in the interest of science, technology and the national economy, can be conducted in such stations. Astronomy and meteorology, geology and oceanography, biology and medicine, like many other fields of science and practice, link great hopes to the appearance of the possibility of carrying out long-term, systematic observations and experiments in orbiting space laboratories.[81] /134

The first experience in establishing such stations was acquired during the six-month operation of the Salyut scientific station, placed into orbit on 19 April 1971. The heroic crew, consisting of pilot-astronaut G. T. Dobrovol'skiy, V. N. Volkov and V. I. Papayev, worked 24 days in this station.

In 1973, the United States of America launched its station, with interchanging three-man crews. The station was called Skylab -- "The celestial laboratory."

Development and construction of manned orbital stations is an exceptionally complicated and costly measure, which is within the power of only the largest space powers of the present time. The possibility of establishing an international orbital station still requires detailed and prolonged study, from many points of view: technical, economic, political and legal.

Nevertheless, some international organizations, first and foremost, the International Academy of Astronautics, has already been occupied for many years with theoretical working out of the problems, connected with study of the possibility of establishing international orbital laboratories. Among other problems, the legal problems, which may arise in accomplishing this type of project, are actively being discussed.

Interest in these problems has increased, particularly in connection with the Soviet-American Soyuz-Apollo project. Actually, at one stage of experimental testing of joint means of approach and docking manned spacecraft and stations of USSR and U.S.A., namely, in the period of the contemplated plan for a two-day joint flight, the single Soyuz-Apollo spacecraft system would be a sort of international orbital station. This will be the first, although brief test of existence of an international manned space system in orbit /135

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[81] See B. N. Petrov, "Orbital stations and study of the earth from space," Vestn. akad. Nauk SSSR 10, 15-30 (1970).

around the earth, the prototype of future international orbital stations.

What legal questions might arise in the future, in the case of establishment of long-term international orbital stations? Will their legal regulation differ from the overall regulation of space objects by established, effective space law? How are these problems solved, in connection with the forthcoming experimental joint flight of Soyuz and Apollo?

The first difficulty, which arises in discussion of these questions, is purely terminological. In astronautics and in space law, there still are no conventional definitions of space laboratories or space stations, and these terms sometimes are used in the literature to designate the most diverse spacecraft, including unmanned artificial earth satellites. More than that, a paradox of the contempory state of space law is that legal regulation of space and space objects has been established, without a legal definition of them.

Naturally, it is difficult to answer the questions, as to whether or not there is specific legal regulation of international orbital stations, without having conventional legal definitions of such stations, space objects or space itself. For this reason, in essence, a conclusive answer has not been given to the question, in the course of discussion of the legal status of the orbital stations, at a number of international colloquia on space law.

It can be suggested theoretically that an international orbital station will be built, either by an international organization (specially established or even existing), on the basis of a bilateral or multilateral agreement between governments. A case is possible, when a State, having built an orbital station, then wishes to give it an international character, by means of offering opportunities for setting up experiments of foreign scientists, including foreign astronauts in the crew or using the laboratory as a "transit point."

It would hardly be advisable or possible even now, to attempt /136 to establish legal regulations for all these situations. We shall dwell only on general legal questions, which may be of importance for similar cases. We stipulate here that the term "international orbital station or laboratory" is understood to be any long-term manned station, which might come into existence in the future, located in orbit around the earth and being of an international nature, to one degree or another.

The legal status of such a station will have all the traits inherent in all space objects and certain specific singularities. The common traits are designed by international agreements in force: the 1967 Treaty on Space, the 1968 Agreement on Rescue of Astronauts and the 1972 Convention on International Responsibility for Damage. The specific singularities flow mainly from the international nature of the station.

Registration and Jurisdiction.

In accordance with international space law, there is no obligatory international registration of space objects. In the 1967 Treaty on Space, the question was only of national registration, i.e., of entering the space object in the register of some government. Important legal consequences are connected with the act of registration, both for the government of registration and for the object itself. The government of registration exercises jurisdiction and control of the space object and of any crew of this object, during the time they are in space. This means that, in the case of an international object, its registration with a specific government makes this object and the crew in it subject to the law and order and jurisdiction of this government.

The government, to which the orbital station belongs, in the register of which it is recorded, exercises jurisdiction, not only with respect to its, but foreign citizens aboard it. This government has an international responsibility for the actions of the entire crew. However, there is so-called personal jurisdiction of the government over its citizens, regardless of their location in one territory or another. This can make it necessary to conclude /137
a special agreement or agreements between the interested governments, on questions of registration of the station and exercise of jurisdiction.

In the case of the joint flight of the Soyuz and Apollo spacecraft, each of the spacecraft will be registered in its country. However, the parties have agreed that, in transfers of the astronauts from one spacecraft to the other, in accordance with the previously determined schedule of work, the commander and the ground control center of that country, to which a given spacecraft belongs, will direct the activities of the crew aboard the respective craft.

The desirability of a special agreement, if the crew is to be aboard the station belonging to an international organization, becomes still more obvious. In such a case, the jurisdiction of the State in which the station is registered is in effect. However, in this case, the attempt of governments to retain personal jurisdiction over its citizens will undoubtedly be more urgent and, in connection with this, it requires special international regulation.

The importance of questions of jurisdiction and law regulating the interrelationships between crew members will increase, in proportion to increase in number of astronauts simultaneously aboard the station and with the duration of their stay in space. As is well known, projects for superlarge, multipurpose orbital stations, designed for crews of up to 100 persons and more, are being discussed now. Of course, having such a number of people aboard a station requires development of a definite internal regulation, by which the crew of the station will be guided, and also of a clear definition of the competence of the States, with respect to discussion of civil-legal, criminal and other questions, which might

arise in the interrelationships among the members of such a large crew.

Ownership Law.

Article VIII of the Treaty on Space determines that the law of ownership of space objects and their component parts remains unaffected during the time of their stay in space, on a celestial object or during the return to earth. In the case of an international object, the question arises: To whom does this right of ownership belong? In practice, various versions of solution of this /138
problem are known. Thus, the agreement on Intelsat establishes that the Intelsat satellites are owned, on the basis of the undistributed shares of the participants in the system, in proportion to their respective contributions towards covering the cost of planning, development, construction and establishment of these satellites. It is contemplated in the agreement on Intersputnik that the space complex can be the property of the Organization or it can be leased to members of the Organization. In the case of installation of scientific instruments of several countries in a satellite provided by some government, the right of ownership to these instruments must be retained by the corresponding governments. It flows from this that the question of the rights of ownership in international space stations and their component parts can be solved in different ways, depending on the agreements between the interested governments.

This question does not arise in carrying out the Soyuz-Apollo project, since, during the entire flight and after completion of it, the government completely retains the rights of ownership to their craft. No financial settlements between the countries are contemplated on this project.

Rescue Operations.

The Agreement on Rescue of Astronauts, Return of Astronauts and Return of Objects Launched into Space, signed in 1968, provided that astronauts and space objects return to the "powers accomplishing the launch." Article 6 of the Agreement explains that this term refers to the government or international organization responsible for the launch, on condition that this organization declares acceptance of it by the rights and duties provided for by the Agreement and that the majority of the member governments of this organization are participants in the Agreement on Rescue and the 1967 Treaty on Space.

The duties of the governments in rescue and return of crews provided for by this Agreement, differ from their duties in rescue and return of the space objects themselves. Governments must take all possible measures to rescue and give the necessary assistance to a spacecraft crew, landing on foreign territory, as a result of an emergency, disaster, forced or unintended landing. Such a crew /139
is immediately returned to representatives of the power accomplishing

the launch. The space objects themselves and the component parts are rescued and returned to the powers accomplishing the launch, only upon request of the latter and at their expense.

The 1967 Treaty on Space also provided for the duty of astronauts of different governments giving possible assistance to one another, in case of necessity, when they are in space or on other celestial bodies.

To put these duties into practice and to provide the technical capabilities of carrying out the rescue work in space, solution of the question of international unification or compatibility of docking mechanisms of spacecraft and orbital stations is of great importance. Otherwise, the provision of the Treaty on conducting rescue work in space by various governments may remain only pleasant provisions. Precisely for this reason, the understanding of the Soviet Union and the Unitied States, on establishing joint spacecraft and station approach and docking means in the Soyuz-Apollo project and on conducting tests of these means, under conditions of actual space flight, has acquired such great importance.

Right of Visitation.

In accordance with Article XII of the 1967 Treaty on Space, all stations, installations, equipment and spacecraft on the moon and other celestial bodies are open to representatives of other governments on a reciprocal basis, with observance of specific conditions (previous notification). Analysis of this and other articles of the Treaty do not give a basis for thinking that such a right can be interpreted broadly and also be recognized, with respect to manned stations in orbit around earth. This opinion is shared by a number of specialists in space law.

In case a government wishes to send its astronauts to an orbital station belonging to another government or group of governments, previous agreement of the latter must be obtained. The Treaty on Space also does not approve use of orbital stations for inspection /140 of unmanned space vehicles, without the agreement of the governments to which they belong.

In addition to what has been enumerated, another large group of legal questions, connected, for example with interpretation of the Convention on Responsibility for Damage or with other interrelationships between participants in joint work, can arise. Therefore, in executing any international project of this kind, conclusion of an international agreement is necessary, defining the mutual rights and responsibilities of the participants and their obligations toward third countries. In preparing the Soyuz-Apollo project, the parties worked out and accepted a number of technical and organizational documents, confirmed by intergovernment agreements, signed by the Chairman of the Council of Ministers, USSR, and the President of the U.S.A.

The purpose of a space object, its mission, is of great importance importance, for legal charactorization of any space object, including an international orbital station.

Long-term orbital stations will perform multipurpose scientific-technical and applied functions. However, specific specialization of orbital stations is not excluded, in this case. Those of them, which are intended for study of earth resources or atmospheric research have to be in relatively low orbits. It is advisable to establish astronomical and radioastronomy stations in high orbits, of tens and hundreds of thousands of kilometers.

Establishment of long-term stations clearly will take place in several stages, in which narrow-purpose stations, with small crews and relatively short periods of existence, will be used in the first stages.[82]

Speaking of prospective uses of orbital stations for various purposes and the singularities of their procedures connected with it, the publication of a report on a discussion in the U.S.A. might be mentioned; it is on plans to establish a station for performing /141 various technological operations, which it is proposed to lease to industrial companies in the 1980's and, then, to completely transfer ownership to them.[83] Of course, such use of orbital stations requires special intragovernment and international regulations.

An unusual legal condition will be characteristic of international orbital stations, if they are used in the future as launch pads for interplanetary flights.

The purpose of a space object plays an important part in its legal qualifications, in connection with the fact that the freedom of space activities of the States is not unlimited, as is well known. The use of new technical means must not lead to violation of the principles and standards of international law in general and of international space law in particular.

Space activity in contradiction to these principles and standards must be acknowledged to be illegal. The Treaty on Space, for example, forbids placement in earth orbit of any objects, aboard which there are nuclear weapons or other types of mass destruction weapons. It is completely obvious that this prohibition extends fully to orbital stations. It follows from this that the purpose of an international orbital station and the functions carried out by it

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[82]See B. N. Petrov, "Space research and scientific-technical progress," in the book Lenin i sovremennaya nauka [Lenin and Modern Science], Nauka Press, Moscow, 1970, pp. 150-158.

[83]See Aviation Week and Space Technology 91/19, 61-64 (1969).

may be of decisive importance for determination of its international legal regulation.

National and international orbital stations must serve the work of peace and progress on earth and in space.

IN PLACE OF A CONCLUSION

Space. Cooperation. Law. These concepts have long been found together.

The entry into space has opened a new page in the history of terrestrial civilization. The Soviet people were the first to walk on the path of mankind to the stars. But the exciting mission of mastering universal space is not within the power of one government, however great and powerful its capabilities. "This affair is infinitely difficult, it requires extreme intensity of effort and the gift of genius," wrote our great countryman K. E. Tsiolkovskiy. "Astronautics cannot be compared with flight in the air. The latter is a plaything, compared to the former."[84]

Space is the common road of all mankind. The broadest cooperation at all levels is required of those who intend to take this road: between individual scientists, scientific groups, organizations and governments.

The law has never been an end in itself. Its mission is to serve the specific needs of society. International space law does not constitute an exception in this sense. It came into being to serve the requirements of the States in international regulation of space activity and to create the most favorable condition for development of broad international cooperation in the study and mastery of space.

The present picture of international cooperation in space is complicated and controversial. We cannot fail to be surprised at the scope and depth of what has already been achieved. Specially created intergovernment and public organizations are actively operating in the international arena, dozens of international /143
agreements have been concluded, international satellites and research rockets are systematically launched, international applied satellite systems have been established, and space has brought the countries and continents closer together. However, as in many other matters, differences in approaches to solution of problems show up in space matters, on the part of governments of contrasting social systems. The monopolistic groupings of the countries of the capitalist world, engaged in space business, are attempting to place their narrowly egotistical interests above the interests of those of the public and those common to all mankind. These contradictions in solution of political and legal problems of mastery of space are manifested especially graphically. They are experiencing space law, which

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[84] K. E. Tsiolkovskiy, Cobraniye cochineniy [Collected Works], Vol. II, USSR Acad. of Sci. Press, Moscow, 1954, p. 299.

forms the basis of international relations in this field. The new standards of law are the result of long political and diplomatic struggle and reasonable compromises, dictated by the requirements of international cooperation. Special stipulated rules, regulating the scientific and technical cooperation of the governments in study and research in space are organically interwoven into the fabric of modern space law, together with the general principles and standards. Although many of these rules are not of a general, but of a specific nature, they are an important component element of international space law, which cannot be considered separately from them.

Scientific and technical progress is giving birth to new legal problems. This is the general rule. However, in practice, international cooperation is a case of feedback, when international agreements in the legal field have served as an occasion, a stimulus to bringing to light of international scientific and technical programs and projects. Thus it was, for example, with the Soviet-American Soyuz-Apollo project, the working out of which was dictated to a considerable extent by a desire to find a way to embody the international legal responsibility of astronauts of different countries to give assistance to one another.

We find ourselves in a very elementary stage of both the changing activity of people in space and of the process of unification of the efforts of governments and peoples to carry out this activity. It is difficult to predict the rates and consequences of either process. However, it is clear that, while the first of them is irresistible and is caused by the very logic of the development of science, technology and civilization, the second is tightly bound to the condition of social life on earth and the political relations between governments. Cooperation in space cannot be separated from cooperation on earth. /144

Despite the great successes achieved in setting up joint work of the governments in space in recent years, we still are very far from the ideal picture drawn in the imagination, of the assault on space by the unified forces of all earthmen. But this time is coming.

APPENDIX

International Space Program of the Soviet Union (Basic Agreements)[85]

AGREEMENT between the government of the Union of Soviet Socialist Republics and the government of the French Republic on cooperation in the field of study and mastery of space for peaceful purposes. /145

The government of the union of Soviet Socialist Republics and the government of the French Republic,

Acknowledging the importance of study and mastery of space for useful purposes,

Considering that cooperation between the USSR and France in this field will facilitate further expansion of cooperation between the two countries and respond to the spirit of the traditional friendship between the Soviet and French peoples,

Believing that such cooperation in the field of space would be an important step in the matter of setting up European scientific-technical cooperation,

Expressing satisfaction with the contacts between interested organizations of the USSR and France in this field, which have already taken place,

Have agreed on the following:

ARTICLE 1

Both Governments have come to an understanding on the preparation and accomplishment of a program of scientific-technical cooperation between the USSR and France, in the field of study and peaceful mastery of space. For these purposes, they will render support and assistance to the interested organizations of both countries.

ARTICLE 2

This cooperation will be put into practice:

-- In the field of study of space, including, in principle, the launch of a French satellite by the Soviet Union;

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[85]The documents are placed in chronological order.

-- In the field of space meteorology, using the newest scientific apparatus;

-- In the field of study of space communications through artificial earth satellites, as well as joint projects and experimental work, particularly in the field of television; /146

-- By means of exchange of scientific information, apprentices, scientific delegations and the organization of conferences and symposia.

Scientific information obtained during conduct of joint experiments must be accessible to both High Contracting Parties and be transmitted at acceptable times. First publication rights will belong to the authors of the experiment.

ARTICLE 3

Subsequently, in accordance with mutual understandings, other fields of cooperation may be defined.

ARTICLE 4

The program and conditions of cooperation in the fields contemplated in Article 2 of this Agreement will be defined by working protocals.

ARTICLE 5

Mixed working groups of representatives of scientific and technical organizations of both countries will insure development and execution of a program of cooperation.

ARTICLE 6

Each of the High Contracting Parties informs the other party of completion of the legislative procedures, necessary for this Agreement to come into force. The Agreement comes into force on the day of the last of these notifications.

This Agreement is concluded for a period of ten years. It remains in force until it is denounced by one of the parties. In this case, it ceases to be in effect two years after notification of denunciation.

ARTICLE 7

By request of one of the High Contracting Parties and by mutual agreement, refinements and additions may be incorporated in this Agreement.

In witness whereof, the representatives of the two Governments have signed this Agreement and affixed their seals to it,

Concluded in the City of Moscow, 30 June 1966, in two copies, in the Russian and French languages, in which both texts have the identical effect.

By authority of the Government of the Union of Soviet Socialist Republics	By authority of the Government of the French Republic
A. Gromyko	Couve de Murville

Pravda, 1 July 1966

PROVISIONAL REGULATIONS on permanent mixed working groups, on the basic areas of cooperation of the Socialist countries in the field of exploration and use of space for peaceful purposes /147

1 Establishment of Working Groups

1. Permanent mixed working groups (subsequently called "working groups") are established, in accordance with the recommendations of the Conference of Experts, representatives of the socialist countries on exploration and use of space for peaceful purposes (Moscow, 5-13 April 1967), of representatives (scientists and specialists) of the People's Republic of Bulgaria, the Hungarian People's Republic, the German Democratic Republic, the Republic of Cuba, the Mongolian People's Republic, the Polish People's Republic, the Socialist Republic of Romania, the Union of Soviet Socialist Republics and the Czechoslovakian Socialist Republic.

2. Working groups are established in the following four basic areas of cooperation: 1) space physics; 2) space communications; 3) space meteorology; 4) space biology and medicine.

3. The working groups in each area include, as a rule, no more than five scientists and specialists from each of the cooperating countries. Depending on the subject of the cooperative work or other circumstances, the country may change its representatives, by notifying the national coordinating bodies of the other countries of this.

4. Direction of the activity of the national parts of the working groups and organizational support of their functioning is entrusted to the national coordinating bodies of the participant countries in the cooperation.

2 Basic Tasks of Working Groups

1. The basic tasks of the working groups consist of insuring completion and further development of a program of cooperation in the corresponding area, as well as achieving a high scientific-technical level of the joint work, mainly by means of consideration and solution of scientific and technical problems arising during the cooperation.

2. To perform the tasks specified, in particular, the working groups are charged with:

-- Regular consideration of the course of fulfillment of existing protocols (agreements) on specific subjects of cooperation;

-- Study of proposals to set up new work and to develop new forms and methods of cooperation;

-- Working out plans of the protocols (agreements) on specific subjects, experiments and other joint work;

-- Consideration of proposals for development and production of scientific apparatus, equipment and devices by enterprises of the participant countries in the cooperation;

-- Development of programs of joint work in launching satellites and rockets, for purposes of exploration and use of space; /148

-- Preparation of proposed plans for conduct of conferences, symposia, scientific schools and apprentice programs in the respective areas of cooperation;

-- Execution of other scientific measures, necessary to put agreed programs of cooperation into practice.

NOte: Plans and programs, according to protocols (agreements) concluded on cooperation, including specific duties of the parties, measures to implement them and times for completion of separate stages of the work, can be agreed to directly between the heads of organizations responsible for accomplishment of the work, provided for in the protocols (agreements). Meetings of responsible representatives of the chief organizations can take place jointly with meetings of the working groups in areas of cooperation or independently.

3 Procedure of Working Group Meetings

1. Meetings of working groups are held as necessary, but at least once a year, in the participant countries of the cooperation, in turn.

2. The working group chairman is elected, as a rule, from the representatives of the participating countries. He fulfills the function of chairman at working group meetings and directs its activity until the next working group meeting. The activity of the chairman is of an organizational nature.

3. The date and place held and the agenda of a coming meeting of the working group are planned beforehand at each working group meeting and, in the period between meetings, in addition, they are precisely defined and coordinated by the working group chairman, with the participating countries and with other participant countries of the cooperation. No later than two months before a working group meeting, its chairman informs the national coordinating bodies of all participant countries in the cooperation of the specific date, place and agenda of the coming meeting.

4. Depending on the agenda of the meeting and nature of the problems discussed, the working groups may assemble the full or reduced membership of representatives of the participant countries in the cooperation, and each country can call advisers and experts to participate in the meeting, in case of necessity. To convene the full or a particular membership of the working group, an invitation to all members of the group is required. All participant countries in the cooperation are obliged to respond to this invitation. In the event one of the participant countries in the cooperation expresses its disinterest ahead of time in questions to be discussed at the working group meeting, the working group may be convened without participation of the delegation of this country.

5. Participating countries undertake the tasks of the secretariat of the meeting and bear organizational expenses connected with performing it. The directing countries bear the administrative and maintenance expenses of working group members.

4 Recommendations and Decisions /149

1. The results of working group meetings are placed in official form, in the form of a general protocol, which is signed by the representatives of all the countries participating in the meeting, as well as in the form of individual decisions and recommendations.

2. Decisions and recommendations of the working groups on scientific-technical and scientific-procedural problems are effective immediately, for countries expressing acceptance of them.

Decisions and recommendations on organizational and financial questions, including those, which may flow from the corresponding scientific-technical decisions and recommendations, become effective after their consideration and approval by the national coordinating bodies, in accordance with procedures established in each country. The national coordinating bodies inform the chairman of the working group of approval or refusal of decisions and recommendations, no

later than two months after completion of the working group meeting; the chairman informs all interested countries of this. In case any country requests extension of the time for consideration of decisions and recommendations, it must notify the other countries of this by the end of the two-month period.

3. Each country has the right to declare its interest in any problem, which is considered by the working group. In its meetings, the working groups will attempt to see that their decisions and recommendations are accepted by all interested countries.

In the absence of unanimity, decisions and recommendations are effective only for countries expressing acceptance of them.

4. Each of the participant countries in the cooperation, declaring its disinterest in acceptance of any decision or recommendation, can subsequently associate itself with the decisions and recommendations.

Organizational and financial problems which might arise, as a result of this association, are subject to special consideration by the working groups and national coordinating bodies of the participant countries of the cooperation.

5 Concluding Resolutions

1. These Provisional Regulations come into force after their approval by the national coordinating parties of the participant countries of the cooperation.

2. Changes and additions to these Provisional Regulations can be incorporated, with the agreement of all national bodies of the participant countries of the cooperation.

3. A question of the necessity for further existence of working groups is decided at a meeting of representatives of the national coordinating bodies of the participant countries of the cooperation.

The Provisional Regulations were approved at a Conference of National Coordinating Bodies on Cooperation in the Study of Space of the People's Republic of Bulgaria, the Hungarian People's Republic, the German Democratic Republic, the Republic of Cuba, the Mongolian People's Republic, the Polish People's Republic, the Socialist Republic of Romania, the USSR and the Czechoslovakian Socialist Republic (Moscow, 14 June 1968).

AGREEMENT between the USSR Academy of Sciences and the European Space Research Organization /150

1. The USSR Academy of Sciences, on the one hand, and the European Space Research Organization, on the other hand, will accomplish a periodic exchange of scientific and technical information published by them, without restriction as to its use. This information includes:

a) Publications of the scientific institutions of the USSR Academy of sciences and the Main Administration of the Hydrometeorological Service of the Council of Ministers USSR, namely; collections of scientific work, conference materials, separate reports, preprints and bibliographies on space research;

b) Publications of the European Space Research Organization, namely: scientific memoranda, notes and reports; technical memoranda, notes and reports; special publications; other reports on general questions.

2. The USSR Academy of Sciences and the European Space Research Organization undertake the effort to exchange information on scientific programs and projects, which are of mutual interest, for the purpose of study of their possible coordination.

If, after exchange of information, coordination or joint participation in performance of such programs and projects is found to be desirable and possible, a special agreement will be concluded for this purpose, in each specific case.

3. The USSR Academy of Sciences and the European Space Research Organization are agreed in principle to accomplish exchange of visits of specialists, for the purpose of mutual familiarization with the chief scientific work. Putting such an exchange into practice and determination of the time and lengths of visits will be accomplished by understandings between the parties.

4. This Agreement does not contemplate financial considerations. In particular, each party bears the expenses of sending the scientific information mentioned in paragraph 1 and the travel expenses of its specialists, provided for in paragraph 3. However, in the cases contemplated in paragraph 2, depending on the circumstances, special financial conditions may be considered.

The Agreement was concluded by exchange of letters between the General Director, European Space Research Organization, H. Bondi (15 December 1970) and the President, USSR Academy of Sciences, Academician M. V. Keldysh (12 February 1971), and it went into effect 12 February 1971.

AGREEMENT on establishment of Intersputnik International System and Space Communications Organization /151

The High Contracting Parties, acknowledging the necessity of assisting in strengthening and development of comprehensive economical, scientific-technical, cultural and other relations, by means of establishing communications, and also radio and television broadcasting through artificial earth satellites;

Acknowledging the usefulness and cooperation in theoretical and experimental research, as well as in planning, building, operation and development of international communications systems through artificial earth satellites;

In the interest of development of international cooperation, on the basis of respect for the sovereignty and independence of States, on a basis of equal rights, nonintervention in internal affairs, as well as mutual assistance and mutual advantage;

Based on the provisions of Resolution 1721 (XVI) of the General Assembly, United Nations Organization and the Treaty on the Principles of the Activities of States in Exploration and Use of Space, Including the Moon and Other Celestial Objects, of 27 January 1967;

Have agreed to the following:

ARTICLE 1

1. An international system of communications through artificial earth satellites is established.

2. To insure cooperation and coordination of efforts in planning, building, operation and development of the communication system, the High Contracting Parties establish the international Intersputnik organization, subsequently called the Organization.

ARTICLE 2

1. Intersputnik is an open international organization.

2. Members of the Organization are the governments signing this Agreement and depositing its ratification documents for custody, in conformance with Article 20, and also governments of other States, joining this Agreement, in conformance with Article 22.

ARTICLE 3

The seat of the Organization is established in the City of Moscow.

ARTICLE 4 /152

1. The international system of communications through all official earth satellites includes, as its components:

-- A space complex, consisting of communications satellites with relays, onboard facilities and ground control systems, providing for normal operation of the satellites;

-- Ground stations, accomplishing mutual communications through artificial earth satellites.

2. The space complex is the property of the Organization, or is leased from Members of the Organization having such systems.

3. The ground stations are the property of the States or recognized operating organizations.

4. Members of the Organization have the right to connect ground stations built by them to the communication system of the Organization, if these stations satisfy the technical specifications of the Organization.

ARTICLE 5

Establishment of the international communication system is contemplated in the following stages:

-- The stage of conduct of experimental work by Members of the Organization, in their ground stations, using the communications channels furnished free of charge to the Organization by the Union of Soviet Socialist Republics in its communications satellites. The duration of this stage is set as the end of 1973;

-- The stage of work using communications channels in the communications satellites of Members of the Organization, on a lease basis;

-- The stage of commercial operation of the communication system, using the space complex, which is the property of the Organization or leased from its Members. The transition to this stage will be accomplished, when building of the space complex belonging to the Organization or leased by it is acknowledged to be economically advisable by the High Contracting Parties.

ARTICLE 6

Launch and injection into orbit of communications satellites, which are property of the Organization, as well as control of them in orbit, is accomplished by Members of the Organization, having the appropriate means for this, on the basis of agreement between the Organization and Members of the Organization.

ARTICLE 7

The Organization coordinates it activity with the International Union of Electrical Communications, and it also cooperates with other organizations, the activities of which concern use of communications satellites, both in the technical sense (use of the frequency spectrum, application of technical standards to communications channels and standards for apparatus) and as to questions of international regulation.

ARTICLE 8 /153

The Organization is a legal person, and it is authorized to conclude treaties, acquire, lease and alienate property and to undertake legal actions.

ARTICLE 9

1. In the territories of States, the governments of which are Members of the Organization, it enjoys the legal capacity, necessary to achieve its goals and to carry out its functions. The extent of this legal capacity will be defined in appropriate agreements with competent bodies of the States, on the territory of which it performs its activities.

2. On questions not regulated by this Agreement and the agreements specified in paragraph 1 of this article, the legislation of the States, on the territories of which the activities of the Organization are carried out, is applied.

ARTICLE 10

1. The Organization has pecuniary responsibility according to its obligations, within the limits of property belonging to it.

2. The Organization does not have pecuniary responsibility according to the commitments of the High Contracting Parties, just as the High Contracting Parties are not responsible for the obligations of the Organization.

ARTICLE 11

1. The following bodies are created for management of the activities of the Organization:

-- The Council, the authority;

-- The Directorate, the permanent executive and administrative body, headed by the Director General.

The time of establishment and commencement of activities of the Directorate are determined by the Council.

2. Before commencement of the activities of the Directorate, the functions of the Director General of chairmanship of the Organization, specified in paragraph 2, Article 13, are performed by the Chairman of the Council.

3. An Audit Commission is established to monitor the financial activity of the Organization.

4. The Council can establish such auxiliary bodies, as are necessary to accomplish the purposes of this Agreement.

ARTICLE 12

1. The Council includes one representative from each Member of the Organization.

2. Each Member of the Organization has one vote in the Council.

3. The Council meets regularly at least once a year. An extraordinary session may be convened by request of any Member /154
of the Organization or by the Director General, if at least one-third of the Members of the Organization have spoken up in favor of convening it.

4. As a rule, Council sessions are held at the seat of the Organization. The Council may decide to conduct a session in the territory of other States, the Governments of which are Members of the Organization, by invitation of the Members of the Organization.

Before commencement of the activities of the Directorate, the Council assembles alternately in the States, the Governments of which are Members of the Organization, according to their names in Russian alphabetical order. In this case, expenses of conducting the session are borne by the participating members of the Organization.

5. Chairmanship at Council sessions is held by representatives of the Members of the Organization, alternately, in the order of the names of these Members of the Organization in the Russian alphabet. Representatives of Members of the Organization are named vice chairmen in alphabetical order. The Chairman and his Vice Chairman retain their authority until the next regular session of the Council.

6. The competence of the Council concerns questions encompassed by this Agreement.

The Council:

1) Considers and approves measures to establish, acquire or lease, as well as operate, a space complex;

2) Approves plans for development and improvement of the communications system of the Organization;

3) Determines the technical specifications for communications satellites of the Organization;

4) Considers and approves a program for launching communications satellites of the Organization into orbit;

5) Approves plans for distribution of communications channels between Members of the Organization, as well as the procedures and conditions for use of the communications channels by other users;

6) Determines the technical specifications for ground stations;

7) Determines conformance to the technical specifications of the ground stations proposed for inclusion in communications system of the Organization;

8) Elects the Director General and his deputy and monitors the activity of the Directorate;

9) Elects the Chairman and Members of the Audit Commission and approves the work schedule of this Commission;

10) Approves the structure and staff of the Directorate, as well as the Personnel Regulations of the Directorate;

11) Approves the plan of operation of the Organization in the coming calendar year;

12) Considers and approves the budget of the Organization and the account of its implementation, as well as the balance and distribution of profits of the Organization;

13) Considers and approves the annual statements of the Director General on the activities of the Directorate;

14) Approves the statement of the Audit Commission;

15) Takes under advisement official applications of Governments desiring to join the Agreement;

16) Determines the procedure and times of payment of dues, /155 as well as redistribution of payment shares, in accordance with paragraph 5, Article 15;

17) Determines the tariffs for transmission of a unit of information or the cost of lease of a channel in communications satellites of the Organization;

18) Considers proposals to incorporate corrections into this Agreement and proposes them to the High Contracting Parties for approval, in the order established by Article 24;

19) Adopts procedural rules for its work;

20) Considers and decides other questions flowing from the agreement.

7. The Council must attempt to see that its decisions are adopted unanimously. If this is not achieved, decisions of the Council are considered to be adopted, when at least two-thirds of the votes of all Members of the Council are in favor of it. Decisions of the Council are not binding on those Members, who have not voted for their adoption and who announced stipulations to them in written form; however, these Members may subsequently associate themselves with the adopted decisions.

8. In execution of its functions, provided for in paragraph 6 of this Article, the Council acts within the limits of the resources established by the High Contracting Parties.

9. The first session of the Council is convened by the Government of the State, in which the seat of the Organization is established, not later than three months after this Agreement comes in to force.

ARTICLE 13

1. The Directorate consists of the Director General, his deputy and the necessary personnel.

2. The Director General, acting on the principles of one-man management, is the main administrator of the officials of the Organization and, in this respect, represents it in relation with competent bodies of Members of the Organization, on all questions concerning its activities, as well as in relationships with the States, the Governments of which are not Members of the Organization, and international organizations with which the Council deems it necessary to cooperate.

3. The Director General is responsible to the Council and he acts within the limits of the authority given him by this Agreement and by decisions of the Council.

4. The Director General performs the following functions:

1) Insures implementation of decisions of the Council;

2) Conducts negotiations with communications administrations, project organizations and industrial interprises of Members of the Organization, on questions of planning the system as a whole, as well as on questions of planning, production and delivery of elements and units of onboard apparatus of communications satellites of the Organization;

3) Conducts negotiations on questions of launching communications satellites for the Organization;

4) On instructions of the Council, within the framework of the authority established by the Council, he concludes international and other agreements;

5) Compiles the budget for the next financial year, /156
presents it for approval of the Council and accounts to the Council for the execution of the budget for the past financial year;

6) Prepares an account of the activities of the Directorate for the past year, for presentation to the Council;

7) Works out plans for the work of the Organization, as well as for development and improvement of communications systems, and presents them to the Council for approval;

8) Insures preparation, notification and conduct of Council sessions.

5. The Director General and his deputy are elected from among citizens of the States, the Governments of which are Members of the Organization, for a period of four years. The Deputy Director General can be elected, as a rule, only for one year. The Director General and his deputy cannot be citizens of the same State.

6. The personnel of the Directorate is composed of the States, the Governments of which are members of the Organization, with consideration of the professional competence and proper geographical representation.

ARTICLE 14

1. The Audit Commission consists of three members, elected by the Council for a period of three years, from among the citizens of different States, the Governments of which are Members of the Organization.

The chairman and members of the Audit Commission cannot occupy any post in the Organization.

2. The Director General makes all materials and documents, necessary for performing the audit, available to the Audit Commission.

3. The statement of the Audit Commission is presented to the Council of the Organization.

ARTICLE 15

1. A fund (fixed and working) is established, to provide for the activities of the Organization. The decision to establish and the sizes of the fund are settled by the High Contracting Parties by proposal of the Council, and it is officially registered with a special protocol. The size of the participating shares of the Members of the Organization in formation of the fund is established in proportion to the extent of use of the communications channels by them.

2. If, in the process of improving the communications system, the necessity is developed for increasing the fund, the total additional payments are subject to distribution among the Members of the Organization, who have expressed agreement to this increase.

3. The following expenditures of the Organization are covered by means of the payments of Members of the Organization into the fund:

1) On scientific research and design-testwork on the space complex for ground stations;

2) In planning, building, acquiring or leasing a space complex;

3) In payment for launching and injection into orbit of /157 communications satellites of the Organization;

4) For other purposes, connected with the activities of the Organization.

4. Before formation of the fund, the activity of the Organization is performed, in accordance with a special budget, compiled for each calendar year. Expenditures provided for in the budget, for upkeep of the Directorate personnel, conduct of the Council sessions and other measures of an administrative nature, are covered by the Members of the Organization, at a rate established by the High Contracting Parties on recommendation of the Council and officially registered by a special protocol.

5. On entry of new members into the Organization, or in case of departure of a Member from the Organization, the share of dues of the remaining Members of the Organization are changed correspondingly.

6. The current fee, in which payments are made to the fund and budget of the Organization, is determined by the High Contracting Parties, on recommendation of the Council.

7. The Organization makes an extra charge of 3 percent annually, on funds not paid by Members of the Organization in the time established.

8. In case of failure of Members of the Organization to fulfill their financial obligations during one year, the Council decides the question of a partial or complete suspension of rights, flowing from membership in the Organization.

9. The profit obtained from operation of the communications system is distributed among the Members of the Organization in proportion to their total payments. By decision of the Members of the Organization, the profit can be returned, to increase the fund or to establish some special fund.

10. Expenditures for support of participants in conferences and meetings, connected with fulfillment of the tasks of the Organization, including Council meetings, are borne by the High Contracting Parties, sending their representatives to such conferences and meetings.

ARTICLE 16

1. The Organization operates the space complex, supplying communications channels to its Members and other users, in accordance with the provisions of this Agreement.

2. The communications channels available to the Organization are distributed among the Members of the Organization, based on their needs for channels. Communications channels in excess of the total need of all members of the Organization may be leased to other users.

3. Communications channels are supplied for payment, according to the tariffs established by the Council. The tariffs must be at the level of the average world tariffs, calculated in gold francs.

The procedure of settling for communication services is decided by the Council.

ARTICLE 17

1. Any High Contracting Party can denounce this Agreement, by sending written notification of this to the depository government.

Denunciation of the agreement by this High Contracting Party /158 becomes effective at the end of the financial year, in which the one-year period from the day of notification of the depository government of this denunciation elapses. This High Contracting Party must, at times determined by the Council, pay in the total of payments determined by it for the financial year, in which the denunciation becomes effective, and also fulfill all other financial obligations undertaken by it.

2. The amount of money compensation to the High Contracting Party denouncing the Agreement is determined by the Council, in accordance with the total payments of the High Contracting Party to the fund of the Organization, with the physical wear and obsolescence of the basic facilities taken into consideration. Money

compensation is paid after approval by the Council of the budget statement for the financial year, in which the denunciation becomes effective.

ARTICLE 18

1. This agreement can be terminated, with the Agreement of all the High Contracting Parties.

Termination of the Agreement means liquidation of the Organization.

The procedure of liquidation of the Organization is determined by the Council.

2. In case of liquidation of the Organization, its basic facilities are sold, and pecuniary compensation is paid to the Members of the Organization, in accordance with their share of participation in the capital expenditures in building the communication system, with the physical wear and obsolescence of the basic facilities taken into consideration. The cash on hand, with the exception of the portion going to clearing the obligations of the Organization, is distributed among the members of the Organization, in proportion to the actual money payments made to the day of liquidation of the Organization.

ARTICLE 19

The languages of the Organization are the English, Spanish, Russian and French languages.

The extent of use of the languages is decided by the Council, depending on the actual requirements of the Organization.

ARTICLE 20

1. This Agreement is open for signing until 31 December 1972, in the City of Moscow.

The Agreement is subject to ratification. The instruments of ratification are turned over for storage to the Government of the USSR, which is designated the depository of this Agreement.

ARTICLE 21

1. The Agreement comes in to force, after six instruments of ratification have been turned over for storage.

ARTICLE 22 /159

1. The government of any State, not signing this Agreement, can associate with it. In this case, the government sends the Organization Council an official declaration, that it shares the

purposes and principles of the activities of the Organization and accepts the obligations flowing from this Agreement.

2. Documents on association with the Agreement are turned in for storage to the depository government.

ARTICLE 23

For governments, which turn in the implements of ratification or documents of association for storage, after this Agreement comes in to force, it comes in to force on the day the instruments are turned in for storage.

ARTICLE 24

Amendments to this Agreement come in to force for each of the High Contracting Parties accepting these amendments, after their approval by two-thirds of the High Contracting Parties. An amendment becoming effective becomes obligatory for the other High Contracting Parties after they adopt such amendments.

ARTICLE 25

1. The depository government of this Agreement notifies all the High Contracting Parties of the date of each signing, of the date of deposition of each instrument of ratification and each document of association, of the date the Agreement becomes effective, and also of all other notifications received by it.

2. This Agreement will be registered by the depository government, in accordance with Article 102, of the Charter of the United Nations Organization.

ARTICLE 26

This Agreement, the Russian, English, Spanish and French texts of which are equally authentic, will be deposited in the archives of the depository government. Certified copies of the Agreement will be duly dispatched to the High Contracting Parties by the depository government.

In witness whereof, the undersigned, duly authorized, have signed this Agreement.

Accomplished in the City of Moscow, 15 November 1971.

The Agreement has been signed and ratified by the People's Republic of Bulgaria, the Hungarian People's Republic, the German Democratic Republic, the Republic of Cuba, the Mongolian People's Republic, the Polish People's Republic, the Socialist Republic of Romania, the USSR and the Czechoslovakian Soviet Socialist Republic. It became effective 12 July 1972.

AGREEMENT between the USSR Academy of Sciences and the Indian Space Research Organization of the Government of India, on launch of an Indian satellite, by means of a Soviet launch vehicle. /160

Guided by the Treaty on Peace, Friendship and Cooperation between the Union of Socialist Soviet Republics and the Republic of India, having the purpose of assisting in development of cooperation between the two countries in the field of exploration and use of space for peaceful purposes, the USSR Academy of Sciences (AN SSSR) and the Indian Space Research Organization of the Government of India (ISRO), as a result of preliminary discussions between experts of both parties, have agreed on the following:

1. The AN SSSR and ISRO are accomplishing the launch, in 1974, of a scientific satellite, planned and manufactured in India. The launch will be carried out, by means of a Soviet launch vehicle, from the territory of the USSR.

2. To bring this joint project into existence, ISRO

-- During 1972, completes preparation of a technical project of a satellite, which is subject to joint discussion and approval by the experts of both countries;

-- Undertakes the necessary measures to produce a satellite in the time set, according to the agreed technical project;

-- Insures deliver of the satellite, the necessary auxiliary equipment and technical documentation to Moscow.

AN USSR

-- Furnishes a Soviet launch vehicle and launch facilities, and also provides the necessary consultation and technical assistance to execute the joint project;

-- Undertakes the necessary measures to insure the injection of the satellite into the agreed orbit in the time established;

-- Insures participation of Indian specialists in preparation of the satellite for launch at the Soviet spaceport;

-- Insures delivery of the satellite and the necessary auxiliary equipment from Moscow to the workplace at the spaceport.

3. No exchange of financial resources is contemplated in accomplishment of the projects specified above. Each party bears the expenses, connected with fulfillment of the responsibilities it has assumed, including expenses for sending its specialists.

4. For purposes of making the responsibilities of the parties specific, it is acknowledged to be advisable to develop a Regulation

on the order of work to execute the joint project at all stages of it.

5. For solution of specific technical questions, it is acknowledged to be advisable to set up a mixed working group, the composition of which will be determined by agreement of the parties. Each party names a project director, who has full responsibility for fulfillment of the responsibilities assumed by the corresponding parts of the working group.

The working group performs its activities under the joint leadership of the USSR Academy of Sciences (the Interkosmos Council) and /161
the Indian Space Research Organization of the Government of India, on the basis of this Agreement and Regulation on the order of work to execute the joint project at all stages of it.

6. The scientific results of the joint project are available to the participants in this Agreement. However, according to understandings between the participants in the Agreement, such information will be furnished to the world scientific community.

Executed 10 May 1972 in Moscow, in two copies, in the Russian and English languages. Both texts are authentic.

The Agreement is in effect at the moment it is signed.

For the USSR Academy of Sciences	For the Indian Space Research Organization of the Government of India
M. V. Keldysh	M. H. K. Menon

AGREEMENT between the Union of Soviet Socialist Republics and the United States of America on cooperation in the exploration and use of space for peaceful purposes

The Union of Soviet Socialist Republics and the United States of America,

Considering the role, which the USSR and U.S.A. are playing in exploration and use of space for peaceful purposes,

Striving toward subsequent expansion of cooperation between the USSR and the U.S.A. in mastery of space for peaceful purposes,

Noting the favorable experience in cooperation in this area accumulated by the parties,

Desiring to furnish the results of scientific research, obtained in the matter of mastery of space for peaceful purposes, for the good of the peoples of the two countries and all the peoples of the world,

Keeping in mind the provisions of the Treaty on the Principles of the Activity of States in Exploration and Use of Space, including the Moon and other Celestial Objects, as well as of the Agreement on Rescue of Astronauts, Return of Astronauts and Return of Objects Launched into Space,

In accordance with the Agreement between the Union of Soviet Socialist Republics and the United States of America on exchanges and cooperation in the fields of science, technology, education, culture and in other fields, signed 11 April, 1972, and for the purpose of further development of the principles of mutually advantageous cooperation between the two countries,

They have agreed to the following:

ARTICLE 1 /162

The parties will develop cooperation in the field of space meteorology, study of natural resources, investigation of circumterrestrial space, the moon and planets, space biology and medicine, and, in particular, will cooperate, for purposes of undertaking all necessary measures to encourage and guarantee fulfillment of the "Summary Document on the Results of Discussion of Questions of Cooperation in the Study of Space, between the USSR Academy of Science and the U.S.A. National Aeronautics and Space Administration," of 21 January 1971.

ARTICLE 2

The parties will carry out this cooperation, by means of mutual exchange of scientific information and delegations, organization of meetings of scientists and specialists of both countries, as well as in such other forms, on which mutual understanding may be achieved. For development and execution of the corresponding programs of cooperation, mixed working groups may be established.

ARTICLE 3

The parties have reached an agreement on conduct of work to establish compatible means of approach and docking of Soviet and American manned spacecraft and stations, for the purpose of increasing the safety of manned flights in space and to provide the capability of accomplishing joint scientific experiments in the future. The first experimental flight, to test such means, providing for docking of a Soviet Soyuz type spacecraft and an American Apollo type spacecraft, with mutual exchange of astronauts, is planned to be carried out during 1975. Performance of this work will be carried out on the basis of principles and procedures, which will be worked out, in accordance with the "Summary Document of the Meeting of the Chairman of the USSR Academy of Sciences and the U.S.A. National Aeronautics and Space Administration, on the question of establishing joint means of approach and docking of manned spacecraft and stations of the USSR and U.S.A.," of 6 April 1972.

ARTICLE 4

The parties will promote international efforts, directed toward solution of international legal problems of exploration and use of space for peaceful purposes, in the name of strengthening law and order in space and of further development of international space law, and will cooperate with one another in this field.

ARTICLE 5 /163

The parties may, by mutual understanding, determine other fields of cooperation in exploration and use of space for peaceful purposes.

ARTICLE 6

This Agreement comes in to force on the day it is signed, and it will be in effect for a period of five years. It may be changed and prolonged, by mutual agreement of the parties.

Executed 24 May 1972, in the City of Moscow, in two copies, each in the Russian and English languages, with both texts having identical force.

For the Union of Soviet Socialist Republics

A. Kosygin
Chairman
Council of Ministers USSR

For the United States of America

Richard Nixon
President
United States of America

Pravda, 31 May 1972.

MEMORANDUM of Understanding between the Interkosmos Council of the USSR Academy of Sciences and the Swedish Administration of Space Activities

The Interkosmos Council of the USSR Academy of Sciences (subsequently called the Council) and the Swedish Administration of Space Activities (subsequently called the Administration):

Being guided by the intergovernment agreement of 12 January 1970, on economic and scientific-technical cooperation between the USSR and Sweden,

Based on the existing agreement on cooperation between the USSR Academy of Sciences, on the one hand, and the Swedish Academy of Science and Academy of Engineering Sciences, on the other hand,

Considering their mutual interest in cooperation in the field of exploration of space for peaceful purposes,

Keeping in mind the understanding reached between Soviet and Swedish scientists, at a meeting in Moscow on 24-28 January 1972, on conduct of an experiment to study the sun, by means of a Swedish spectrometer installed aboard the Soviet Interkosmos satellite,

Considering the fruitful meetings between Soviet and Swedish scientists and specialists in Stockholm, 4-7 September 1972 and in the Crimea, 3-5 December, 1972,

They have agreed on the following:

ARTICLE 1 /164

The Council and the Administration are conducting a joint space experiment in 1975, for the purpose of study of the transition region between the chromosphere and corona of the sun. Observations of the sun will be carried out, by means of a spectrometer, operating in the ultraviolet region of the spectrum.

ARTICLE 2

1. The Administration manufactures and delivers to the Council 1) technological and 2) flight specimens of the scientific equipment. The equipment consists of a spectrometer and coding device. The flight specimen, which will not be used, is subject to return to the Administration.

The technological and flight specimens will be delivered to the Council at times, agreed to between the Council and the Administration.

2. The Administration delivers test equipment to the Council at the time necessary for testing functioning of the equipment before and after installation in the satellite and before launch. After completion of testing, the equipment is returned to the Administration.

3. The Administration furnishes the Council with a tape recorder, which will be used, together with Soviet equipment, for data conversion, for the purpose of obtaining data in a form compatible with the Swedish processing equipment. After completion of processing the data, the tape recorder is subject to return to the Administration.

4. The Administration presents the Council with technical documentation, at times agreed to between the Council and the Administration. The documentation is compiled in the English language and, when necessary, also in the Russian language.

ARTICLE 3

1. The Council provides installation of the scientific equipment in the satellite, testing of the proper functioning of it and launch into the required orbit.

2. The Council gives the Administration technical and scientific assistance in the development phase of the project. In particular, Soviet specialists will visit Sweden, for the purpose of giving consultative assistance to the Swedish specialists, on carrying out the planned program of the project.

3. The Council gives the Administration the data of the Swedish experiment from magnetic tape, at the time agreed to between the Council and the Administration. In addition, the Council may also give, if this is deemed necessary, additional correcting data, which may increase the value of the Swedish experiment.

ARTICLE 4

1. Both parties apply the necessary effort to assist in timely exchange of information concerning this project.

2. Meetings between representatives of the Council and the /165
Administration will be conducted regularly, as necessary.

These meetings, as a rule, will be conducted in the Soviet Union and Sweden, alternately. In case of necessity, additional meetings may be organized, by mutual understandings. The party organizing the meeting will be responsible for translations during the meetings.

3. All necessary documentation on the project will be sent to the Administration from the Council in the Russian language and from the Administration to the Council in English and, in case of necessity, also in the Russian language, in five copies.

Copies of all correspondence concerning this project will be sent to the Council and to the Administration.

4. The results of this experiment will be available to both the Council and the Administration.

The first publication rights will belong to the principal investigator (Soviet and Swedish sides), for a period of one year after obtaining the data.

Upon expiration of the period of one year, records and copies of the processed data will be given to the National Space Science Data Centers and International Data Centers included in the list.

These records will be given to interested scientists, on the basis of inquiries to the International Data Center or other selected custodian. The research results become available to all scientific societies, by means of publication in the appropriate journals or through other established channels.

5. Data on the joint experiment may be published, at the desire of each of the parties, only to the extent of their own part of the projects; publication of information concerning the other part of the project requires previous agreement with the other party.

Both parties agree in advance on text of official reports for the press in the USSR and in Sweden, concerning the joint Soviet-Swedish experiment.

ARTICLE 5

1. The Administration places the entire responsibility for performance of this project on the Swedish Space Corporation (Svenska Rimdaktiebolaget).

2. The two cooperating parties will not exchange financial resources.

Each of the parties will bear the expenses for its part of the project, including travel and the means for maintenance of its personnel, as well as transportation expenses, connected with delivery of equipment, for which it bears responsibility.

ARTICLE 6 /166

This Memorandum does not exclude the possibility of accomplishing other joint space experiments between the Council and the Administration, in astronomy, ionospheric research and other fields of scientific research, using satellites for geophysical rockets.

ARTICLE 7

This Memorandum of understanding comes in to force on the day it is signed, and its effect may be temporarily suspended or finally terminated by each of the High Contracting Parties, upon six months notification.

Chairman Interkosmos Council of USSR Academy of Sciences	Chairman Swedish Administration of Space Activity
B. N. Petrov	Ya. Shernstedt

Signed 21 September 1973.